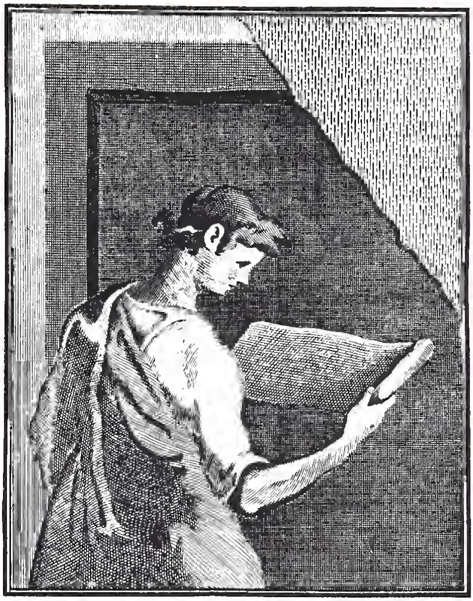
The American Annual of Photography

1921



Ansco Vest-Pocket Cameras

Products of the Best Camera-Building Art

ART in pictures and in camera-building—in the last analysis the same. Not an adding of something decorative or ornamental to remove the curse of commonness or to catch the eye, but an application of superior skill to make the product beautiful and *right* in all respects. True artistry, whether of the artisan or the artist, has this one essential aim—rightness, correctness, in design and in effect.

In Ansco V-P cameras is seen the working out of high ideals in camera construction. No crudeness, no awkwardness is in them. Even a casual glance conveys a sense of fitness and of beauty, arousing the natural human desire to possess that which is beautifully fashioned and precisely adapted to the work which it is meant to do.

This impression is borne out by detailed examination—and by use. Take first, because it leads as the master camera of its class, the Ansco V-P Speedex No. 3. Here bulk and weight have relentlessly been pruned, yet in such manner as to emphasize, not detract from, rigidity and strength. Compact and slender, the No. 3 V-P is yet built to endure and to give instant speedy service to the user. Its refinements are so logical as to be quickly intelligible to the beginner, and to the expert a delight. There is the thumb-operated lever which permits fine focusing rapidly and with a minimum of

Ansco V-P Speedex No. 3

bother; the extra-large brilliant finder; the choice of high-grade anastigmat lenses of the correct focal length for this size, equipped with Acme Speedex shutter giving automatically controlled exposures from one to 1/300 second; and the location of diaphragm markings on the flange of the shutter at the top, so that, if desired, change of aperture, speed and focus can all be made without losing sight of the image in the finder. Refinements like these, with such conveniences as the depth-of-focus scale to be found on the platform bed, and with accuracy of adjustment and quality of finish, tell a story of intelligently directed skill in construction.

Made to take the same size of picture, 2¼ by 3¼ inches, yet built on different lines, the Ansco V-P No. 2 shows a like regard for rightness and reliability, so that it also has become a favorite with exacting amateurs. The front, when extended, is held by side-arms so supported within the body of the camera that they afford by means of their knife-joint tension absolute rigidity in the lens plane. What is attempted feebly in other cameras is here achieved superbly. In lenses there is a choice between the Modico F 7.5 and the Ansco F 6.3 anastigmat, each in Extraspeed Bionic shutter, permitting automatically controlled exposures from 1/10 to 1/200 second. The lens is protected by a hinged watch-cover lid, on the inside of which is found the Ansco


Ansco V-P No. 2

depth-of-focus scale, a feature especially appreciated by the careful worker and pictorialist, as it shows him where to place the focus to best advantage in general view work when using the largest stops. Focusing is by means of a micrometer device, consisting of a milled flange just behind the lens-plate—a device which may be operated instantly and easily while locating the image in the finder. The speed and accuracy with which this camera can be used, its smallness and light weight, the clear brilliant negatives it makes, and the range of exposures permitted by its lens and shutter, have made it widely known—and liked.

The Ansco V-P Junior, also designed to take a 2¼ by 3¼ picture, the most recent addition to the Ansco line, has also won general favor on its merits, for it is inexpensive without being cheap. Covered with fine seal-grain leather and accurately constructed, with choice of several lens and shutter equipments up to and including the F 7.5 Modico in Extraspeed Bionic shutter, it is simple and convenient to operate yet offers the amateur "elbow room" as he becomes more skillful and demanding. A distinctive feature of this camera is its focusing scale, an exclusive patented device which again illustrates the simplicity of art in camera construction. This focusing scale is a fine steel spring which, as the bellows are extended, automatically engages the front at the 25-foot point, the usual "fixed-focus" distance, pressure upon the scale then per-

Ansco V-P Junior

mitting a quick refocus for other distances indicated if desired. The camera is equipped with two tripod sockets, is light, unobtrusive and well made.

Rightness of construction is well illustrated in the Ansco V-P No. 0, which takes pictures 1⅝ by 2½ inches in size. This camera is furnished, if so desired, in a fixed-focus model, but is furnished so only with lenses having a maximum aperture of F 11.3 (U.S.8). The reason for this is simple yet unescapable: experience teaches that a fixed focus with apertures larger than F 11.3 does not give negatives sharp enough except in one plane to satisfy the user wishing to enlarge. Hence for the models carrying the F 7.5 and F 6.3 anastigmat and Extraspeed Bionic shutter, a focusing device is provided which permits the use of the largest apertures without loss of definition. Self-opening, with a definite action which leaves no doubt as to whether the front is extended fully, rigid as a box, accurate and finely finished, this smallest of the Ansco V-P series gives satisfaction not only to the casual maker of snapshots but to the expert photographer as well.

See these cameras at your dealer's.

Ansco V-P No. 0

Complete camera catalog on request.

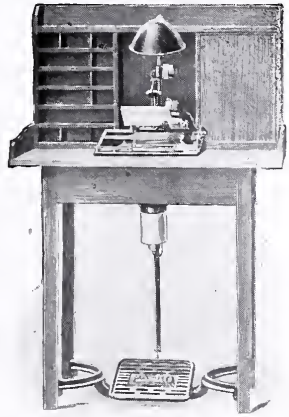
Ansco Company

Binghamton, N. Y.


VENUS

PA-KO Printer

Averages 350 prints per hour on *short runs.* Foot treadle operation leaves both hands free for speedy manipulation of prints.



PA-KO Washer

Electric Driven

Separates prints automatically. Averages 1200 perfect prints per hour.

PA-KO Dryer

3 speeds, full heat regulation, non-creeping apron.

BIRCHES IN SUNLIGHT. L. D. Sweet.

The American Annual of Photography 1921

VOLUME XXXV

Edited by Percy Y. Howe

NEW YORK

THE AMERICAN ANNUAL OF PHOTOGRAPHY, INC.

MCMXX

Federal Printing Co., New York

PREFACE

DESPITE the fact that during the year 1920 there was a gradual return to pre-war conditions, paper and half-tones failed to show any reduction from the prevailing high prices.

In consequence of this increase in cost we were compelled to advance the price of this volume. We hope, however, that conditions will soon permit our resuming our former scale of prices.

The articles and illustrations were selected from a large number submitted, and we wish to extend our most sincere thanks to all those who assisted in the making of this volume, especially to those whose contributions were omitted through lack of space.

Material for our next issue should be sent to 422 Park Hill Avenue, Yonkers, N. Y., prior to July 1st, 1921.

PERCY Y. HOWE, Editor.

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AVARICE. Louis Astrella.

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WINTER WORK

By PAUL L. ANDERSON

ONE of the most fascinating branches of photography, and one which affords tremendous possibilities for both esthetic and emotional expression, is landscape work during the winter months. The reference, of course, is to such times as offer the advantage of snow, for without this the opportunities are rather more limited than in summer, but when snow is present, either with or without sunlight, the whole aspect of the country is changed, so that the work takes on an entirely different character from that which it possesses at any other time of year.

We will consider first the possibilities and requirements of sunlit snow, and it may be said that this work requires a higher development of technical skill than any other branch of pictorial photography, since in order to render such scenes properly everything—exposure, development, and printing—must be absolutely correct. The slightest variation from technical accuracy, and the result is a failure. For this reason, together with the inherent character of the scene, photographs of this nature may fairly be regarded as the extreme development of virtuosity in photography, and the effort to produce satisfactory results contains a great educational value.

On considering a sunny landscape with snow on the ground, the first thing which strikes us is the intense brilliancy of the scene, a brilliancy which rises often to such a pitch as to be actually painful to the eye. The broken surface of the snow shows in spots of intense lustre, with, perhaps, myriads of glittering points where the sun is reflected from individual crystals, and the shadows, instead of having the greenish hue of shadows on grass, are of a high-keyed blue. The gradations of light on the snow are of an exceedingly tenuous and delicate character, and these things, together with the marvelous tracery of bare branches against the white of the snow, or the brilliant blue of the sky, combine to form a whole which for sheer esthetic delight is unsurpassed in all the realm of landscape.

It is obviously impossible to reproduce this intensity of illumination by means of the camera, or, indeed, any pictorial medium; the limitations of pigments, the fact that the result must be viewed in a light less strong than the original, the absorption of light by paper and canvas—all these make absolute reproduction out of the question. But the fact remains that by a proper choice of scale and key, and by an accurate adjustment of relative values within the range of the medium, an impression of truth may be given, calling up memories of similar scenes, and stimulating esthetic enjoyment in the observer. It is not within the scope of this article to discuss pictorial composition; that is a matter which has been dealt with many times, by various writers, and a knowledge of design and pattern is presupposed, so that our present concern is with the methods to be followed in securing a transcription of whatever subject may be chosen.

To begin with, it will be found that the best hours of the day are between sunrise and ten in the morning, and between two in the afternoon and sunset. Between ten and two the shadows are apt to be too short to give a desirable relief, though this must not be considered an invariable rule; there are no absolute rules in art. In the next place, it is generally well to have the shadows falling toward the camera, that is, to have the sun in the hemisphere toward which the camera is pointed, as otherwise there is apt to be insufficient relief. Relief, may however, be sometimes attained even when the sun is partly or directly behind the camera, by the introduction of trees, bushes, water, or other dark objects, though even then the snow remains flat and lacking in gradation. A flat, unbroken expanse of snow is rarely very interesting, and unless

"Old oceans gray and melancholy waste."

the surface is broken by drifts, combs, waves, cracks, or other irregularities, it will usually be found advisable to break it up by means of footprints, which possess the further advantage that they may be so arranged as to form a leading line, carrying the eye toward some desired portion of the scene.

Ruskin is credited with having said that no picture can be truly great unless it contains a human being, or some suggestion of humanity, and though this is far from true the fact remains that the presence of man often adds greatly to a picture, and the suggestion that a man has passed is frequently even more powerful than his actual form, since it carries an element of mystery which is apt to be lacking if the man himself is seen. Also, when one walks through snow, especially deep snow, little scraps of the snow are thrown up beside the tracks, and these, catching the light, form intense spots which contrast well with the dark shadows of the prints.

If the average person be asked the color of cast shadows on snow he will probably state that they are gray, but as a matter of fact such shadows, being illuminated by reflected light from the sky, and lying on a white surface, are strongly blue, as is also the shadow side of the object itself, though the latter is modified by the local color. It follows that such a snow scene as we are considering is in varying shades of white and blue, with blue-gray for tree-trunks, bushes, and so on. To be sure, the color of the light late in the afternoon may be very warm—the writer has seen snow under direct sunlight show a marked crimson color—but even if this warm color is lacking a color-sensitive plate and ray-filter are almost imperative for the proper rendering of values. It is possible to get the gradations on the snow itself with an ordinary plate, but to do this involves so brief an exposure that trees and other dark objects will certainly be under-exposed, and their values lost. The actinic value of the blue shadows, and the blue sky, is so nearly that of the white snow that they cannot be satisfactorily separated without the aid of orthochromatics. Further, the range of values from the intensely illuminated snow to the dark of trees and bushes is so great that a non-halation plate is required. The writer finds that there is no practical difference between the double-coated ortho plate and the backed panchromatic for this work; either will give admirable results.

THE L ROAD, WINTER.

Illustrating article "Winter Work," by Paul L. Anderson.

Films do not seem to work so well; they lack the long scale of gradation, and though good results may be secured by their use they have not so wide an applicability.

As to apparatus, a tripod camera is very desirable, the size depending solely on the worker's preference—whether he wishes to print direct or to enlarge. But the required exposures are so long that a tripod becomes necessary, for despite the intensity of reflected light the original light is relatively weak, and the exposures will be about the same as for the same scene in summer. Of the illustrations accompanying this article, "The Lake—Winter" was made at F/6.8 on a Seed's L Ortho N-H plate, with an exposure of 1/5 second, a five times filter being used; "Trees and Snow" had 1/2 second at F/8; and "The L-Road—Winter," 1/10 second, no filter being used in this case. It may be said that a filter which requires more than five times the unscreened exposure is inefficient, but whatever filter is used it should be adjusted to the plate in use, either by the manufacturers or through experiment by the user. An incorrectly adjusted filter may be worse than useless, giving values which are as faulty in the other direction as those given when no filter at all is used.

As to development, the tank should always be used. It is impossible for anyone to develop a plate with absolute precision by inspection, for the treatment will depend on varying factors; the dark-room illumination, the state of the worker's digestion and consequent keenness of his perceptions, the temptation to give just a little more time to be sure of having enough—all these things contribute to modify the results, and, as has been said, correct development is more necessary here than in any other branch of photography. The tank is subject to no such tremors; given proper concentration of developer, proper temperature, and proper time, the results are assured, nor is there any temptation to juggle the plate if it doesn't look just as expected.

An indication has been given above as to exposures, and it may in general be said that the correct exposure will be from two to five times as great as that called for by the average exposure table (this in order that the shadows may develop to proper strength before the lights are over-done) but no suggestion as to time of development is possible, different plates

TREES AND SNOW.

Illustrating article "Winter Work," by Paul L. Anderson.

and different developers acting in widely varying fashion. It may, however, be stated that the quality of negative to be aimed at is distinctly thin; the extreme shadows should be clear glass, and the lights so thin that when the finished plate is held up to the window objects may easily be seen through the densest portions. The reason for this will readily be understood if we consider the type of print which is to be made. The extreme lights are to be pure white (though for pictorial reasons such areas should be small; light loses its intensity as it spreads, in art as in physics) and the deepest shadows are to be a medium gray. It is a serious mistake to attempt to give a feeling of light by the introduction of heavy blacks; a high-keyed print is the only one which renders the desired effect. For this reason a very soft, quick-printing negative is desirable, though skilful manipulation of the printing medium will sometimes give good results from a negative which, though not too strong in contrast, is a little more dense than the ideal one.

By far the finest printing medium for results of this character is platinum, or its equivalent, palladium. It must be borne in mind that when we are, as here, working for esthetic beauty rather than pictorial effect everything which aids this ideal is worth considering, and the superficial texture of platinum is more beautiful than that of any other paper. A further advantage is that with platinum the highlights may be slightly accented by means of a soft pencil eraser, this having been done in "Trees and Snow," where the sky of the original was nearly flat. Next to platinum in desirability comes a platino-matt bromide or gas-light paper, carbon being less suitable because of its lustre and because of the difficulty of obtaining absolutely pure lights, the latter objection applying also to gum, with the further one that in gum the finer gradations of the negative are apt to be lost, merging into one another. Oil and bromoil are also deficient in fine gradations unless great care is taken with the inking, and on the whole platinum for direct prints and bromide for enlarging are recommended, the writer preferring the Wellington and Ward Platino-matt Thick Rough for this latter purpose.

When we come to consider a winter landscape with the sun hidden, we find that the emotional possibilities are greater and

THE LAKE, WINTER.

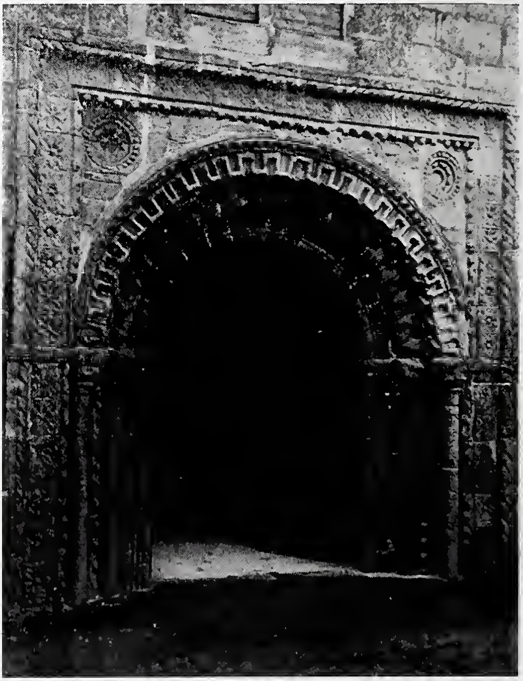
Illustrating article "Winter Work," by Paul L. Anderson.

the technical difficulties less. The mental associations connected with overcast winter weather are those of gloom, sadness, melancholy, as contrasted with the joy and brightness of sunlit snow. Since the sadder emotions are the deeper, and since it is thus easier to produce an emotional effect by their stimulation than by appealing to the lighter ones, it follows that subjects of this nature are particularly adapted to the worker who aims at pictorial effect rather than mere esthetic beauty. Gray, gloomy days, storm, wet snow—all these contribute to arouse memories of those who have struggled against cold and blizzard, and here the introduction of figures is especially suitable, provided it is done with such reserve as not to let tragedy descend to melodrama. Subjects of this character are necessarily treated with greater breadth than when sunlight is present; the meticulous daintiness of the lighter picture would be out of place here, and, in general, the prints should be larger in size, for though estheticism may be expressed in small areas pictorial effect demands the largest space available without exceeding the natural limits of the medium. Oil and bromoil are peculiarly suited to this form of expression, the possible variations of texture and control of values adapting them well to the work. Gum is also admirable, carbon and platinum less desirable, their good qualities being of no great value here, while their deficiencies assume considerable importance.

Since with an overcast sky the color is largely lost, the landscape being done in shades of gray, orthochromaticism possesses no value, though it does no harm, of course. The ray-filter may be abandoned, with consequent shortening of exposure, though the weaker light will not permit great brevity. The non-halation feature is desirable, and, indeed, it is valuable in all landscape work as well as in most portraiture. Exposure and development need not be so precise, for absolute accuracy is less important in the negative as well as in the print, a slight variation from actuality being readily attributable, in the observer's mind, to a difference in the quality of the light or the time of day. Subjects of this nature will have, in the print, no absolutely clear highlights, nor will they show black shadows. The general range of tones will be about as in the brighter subjects.

IN A LAND OF ROMANCE. J. M. WHITEHEAD.

It is worth noting that the second class of picture demands a larger type of vision and a broader human sympathy, as well as more study and effort, than the former yet the results will more than repay the added labor. The lighter character of picture satisfies for a time, but lacks the enduring qualities of the deeper sort and in the end loses its interest. Whereas, the other both to worker and to observer, gains with the passing years in proportion to its soundness of vision and to the depth of feeling expressed by the artist. It may be hung on the wall without becoming wearisome, and the photographer may go on for years struggling to attain an ideal which ever eludes him, yet ever incites him to pursuit. No picture is perfect, but the more of effort and thought and love which go to its making the finer it will be, and the greater the happiness which will come from striving ever for higher ideals which inevitably grow as the worker himself grows.



NORMAN DOORWAY,
KENILWORTH CHURCH. A. L. HITCHIN.

PHOEBE ANN WHITE.

PHOTOGRAPHIC LENSES—TYPES AND USES

By CARL W. ATKINSON

"WHAT Lens Shall I Buy?" This title to a booklet, published by a well known optical firm, is a question which every photographer or "camera-fiend" asks himself sooner or later, if he progresses beyond the ranks of the tyro. Everywhere in the photo magazines and optical catalogues he reads "Information" as to the properties of this lens or that lens; he sees the various manufacturers claiming superiority for their product on this or that ground; sees this, that or the other type of lens construction extolled or anathematized until his head is in a whirl and he is rather less well informed at the end of his search than at first. The writer will attempt in this article, to give a brief discussion of the various types of lenses with their characteristics.

In the earliest days of lens making, before photography was dreamed of, a great deal of difficulty was encountered by opticians in obtaining suitable glass, as the manufacturers of that product made it for illuminating or decorative purposes only and had made no attempt to discover ways of overcoming optical defects such as absorption, veins, stresses, etc. Too, it was thought that dispersion varied with refractive index so achromatism was unthought of until Dollond discovered that by mating certain positive and negative lenses, the one of crown and the other of flint glass, an objective was produced, which brought two, hitherto widely separated regions of the spectrum, to a focus at the same point. Further experiments along this line followed, glass makers developed new types of glass until most of the graver faults were overcome.

In the last part of the nineteenth century, Messrs. Schott, of Jena, began a series of elaborate experiments in making new varieties of glass with the result that Drs. Rudolph and Abbe worked out formulae, which enabled the Zeiss works,

CROW'S NEST RESTAURANT AT NIGHT. SOPHIE L. LAUFFER by the aid of the new glasses, to produce lenses giving hitherto unheard of results. Using glasses of these newer types, it is now quite possible to produce photographic objectives which, at relative apertures of about F/6 will give an image on a flat surface, covering an angle of from sixty to eighty degrees, which will bear enlargement to three or four diameters without becoming unpleasantly diffused in any part. If these objectives are stopped down to about F/16, the angle of good definition often extends to eighty-five or ninety degrees. More rapid objectives too are made, one cinematograph lens by Dallmeyer having the wonderful speed of F/1.9, while many work at relative apertures of from F/4.5 to F/6. Of course, in such cases, marginal definition is sacrificed and a lens working at F/4.5 which will give really critical definition at full aperture over a field of from sixty to seventy degrees, does all which can reasonably be asked of it. The Dallmeyer cinematograph lens referred to above, covers a field the diameter of which is but little over one-half the focal length of the objective.

Odd as it may seem, the first fault of glasses to be compensated, that of achromatism—has proven the most stubborn and is now probably the most poorly corrected. This arises from the *Irrationality* of glass; or unequal dispersion of different portions of the spectrum. Messrs. Schott, in 1883, produced two glasses with almost proportionate dispersion throughout the visible spectrum; a phosphate crown and a lead borate alkali flint. With these glasses it was easy to correct for the entire spectrum, but unfortunately they proved not to be permanent, for the crown glass surface tarnished and the flint glass turned milky after a time so they were discontinued.

Glass is now produced which is almost perfectly transparent and annealing processes have been perfected which prevent internal stresses, but it is almost impossible to produce large pieces which do not vary in refractive index in the different portions and many of the most valuable varieties cannot be produced free of small bubbles which, however, do no harm.

Before taking up a discussion of the various aberrations of lenses, it may be well to speak of a standard of definition

WINIFRED LENEHAN. Clarence H. White

It is ordinarily said that if a lens produces an image of a point as a circle not exceeding 1/100 inch in diameter, it will appear as a point and therefore a picture taken with that lens will be sharp to the eye. This is true, provided it be not closely inspected, but no enlargement will be possible: therefore, it is better if the lens give a point image (maximum circle of confusion) not more than 1/250 inch in diameter, in which case it will bear some after enlargement and if the standard of definition demanded of cinematograph lenses (1/400 to 1/500 inch maximum circle of confusion) be attained, so much the better. We may say that a good short focus anastigmat will readily give such resolving power on its own plate or one slightly larger. We may say too that (except in case of telephoto work) a higher standard or quality of definition is quite useless for, since the silver grains in even an excellent plate of ordinary speed (180 Watkins) are about 1/1000 inch in diameter, it can readily be seen that they could not register separations of points less than 1/500 inch in diameter.

The aberrations which affect photographic objectives are many but the principal ones only, will be discussed here as the others are relatively unimportant. These aberrations are: (1) Chromatic aberration; (2) Central spherical aberration; (3) Curvature of field; (4) Symmetrical spherical aberration of the oblique pencils ("Astigmatism"); (5) Unsymmetrical spherical aberration of oblique pencils ("Coma"); (6) Distortion.

Before taking up a discussion of these different errors let us state that broadly speaking, there are two ways of correcting or avoiding noticeable effects of all of them; (a) by compensation, (b) by use of the diaphragm to cut off marginal rays, producing better definition at the cost of speed. It is infinitely better to eliminate errors by compensating the errors of one of the component lenses of a system with the opposite errors of another but, unfortunately, this is exceedingly difficult and it has thus far been found impossible to compensate simultaneously for all errors for objects at all distances. This is due to the fact that the known conditions for the complete correction of one error often increase another, so that the modern photographic objective is really a compromise between optical errors which cannot be entirely eliminated with any of the present varieties of glass which are ground to spherical curves.

Chromatic aberration was thought by the earlier opticians (who, by the way, were telescope makers) to be the most grievous error of an optical system, so Dollond's discovery of a means of correcting it was regarded as a wonderful step forward, eliminating as it did the necessity for an immensely long focal length of the objective.

A maddening difficulty arises here; owing to the irrationality of glass it is impossible to bring all the colors of the visible spectrum to a focus at the same point, though it is possible to bring two or even three together. The others form their foci at other distances from the objective, and their blurred out of focus rays tend to cause a lack of sharpness in the image—particularly when panchromatic plates are used. The extreme variation in the foci of the colors of the visible spectrum even in excellently corrected lenses, is sometimes 0.5% of the focal length. Now if the correction is so carried out that focusing will naturally be done at about the mean of this variation, an objective which works at a relative aperture of F/4.5 can have a focal length of about 9″ or at F/6.3, slightly over 10″ without any of the visible light from a point in focus falling outside a point in the image 1/250 inch in diameter. Unless panchromatic plates are used, this condition is even better, for the greatest variation from the mean correction in photographic objectives, is almost invariably in the red end of the spectrum and the two lenses named could easily be of 12″ and 15″ focus.

The increasing use of panchromatic plates has led the designers to make a slight alteration in the color correction of the newer anastigmats; more attention has been paid to the correction of the red rays even at the expense of the violet. If one of the older type were compared with the newer, the former would be slightly superior when used on non-color sensitive plates, while on panchromats the newer type would have a very slight advantage. The difference would become very decidedly apparent in lenses of 15″ equivalent focal length or more, though in those of short foci it would not be noticeable.

MRS. ETHEL STANDIFORD-MEHLING.

For three color work, a special color correction is necessary for all regions of the spectrum; for not only must the colors come to a focus at the same point, but also their images must be of the same size; such lenses are called "Apochromatic," are usually slower than others and are used for process work.

Because lenses are made with spherical curves, their images suffer from spherical aberration of the three varieties named and from curvature of field. The first variety, spherical aberration of direct pencils, will be dealt with first. If a simple convex lens be directed toward a luminous point so the point and its image lie in a straight line which passes through the thickest part of the glass, it will be observed that the image is not a point but a disc of finite diameter, which seems almost equally sharp for a slight distance either forward or back of the point of greatest sharpness; if now a diaphragm or circular ring be used to mask the marginal zone of the lens, the point of maximum sharpness will shift slightly and the disc be smaller; if successive diaphragms or rings be placed in position, the same result will obtain with the image as at first. It is evident, therefore, that the rays passing through the different zones of the lens are brought to different foci; altering the curvatures of the lens surfaces without changing its power, produces great variation of its performance in this respect and it is quite possible to produce an objective of large relative aperture, which is achromatic and entirely free from spherical aberration over an angle of two or three degrees, by using only two lenses, which may be cemented together. This is the usual form of telescope objective. It is also possible, by using two glasses, to produce a narrow angled photographic objective ("Single achromatic") by using a diaphragm to eliminate marginal rays, thus reducing the speed. Such a lens, if by a really good maker, should cover an angle of about thirty degrees passably well at an aperture of F/11 or F/16.

It is not sufficient for photographic objectives to merely produce a sharp image over a small central angle; the usual angle of view called for in general work is about sixty degrees. When angles other than very narrow ones are needed, spherical aberration of the oblique rays becomes apparent. These

A QUIET EVENING. W. H. PORTERFIELD.

aberrations are of two varieties, symmetrical and unsymmetrical, and are called by the names "Astigmatism" and "Coma." In the former case the distortion of the wave front is symmetrical with respect to two lines, or in plainer language, the image of a luminous point to one side of the center is successively distorted in two directions at right angles to each other, the best focus being a mean between the two; a line, therefore, which runs toward the center of the image circle, will be most sharply in focus at one point, while a line at right angles with it will be most sharply defined at another, so that both cannot be sharp at once where astigmatism is present. When Coma is present, the distortion of the wave front is unsymmetrical and bundles of rays which pass obliquely through different zones of the lens from the same point, will come to foci at different points not in the same line or plane so that the image is a pear shaped one-sided blur like a comet (hence the name Coma).

These two errors can be eliminated over the central and medium angles (up to about thirty degrees) by altering the shapes of the component lenses so that as previously stated, a single achromatic with only two glasses cemented together, can be made to passably cover about thirty degrees, while a really good rectilinear will give very creditable definition over a somewhat larger angle at twice the speed. However, these oblique aberrations cannot be compensated simultaneously with the others, by any combinations of the older types of glass and spherical surfaces, which are the only ones opticians can grind and polish with the necessary accuracy at this time. Moreover, astigmatism and coma are not greatly remedied by the use of a diaphragm.

An extremely troublesome fault of photographic objectives is the curved image cast; the image field being approximately a section of a sphere, whose radius varies from the focal length of the lens to one-fourth that amount—usually about one-half the focal length. It is affected by the lens curvatures as well as by the position of the diaphragm and can be corrected by alterations in curvatures, but a mathematically perfect correction has never yet been attained, though some lenses are so well corrected in this regard that the variations, in the shorter focal lengths, are quite negligible. The field

SOAP AND WATER. HELEN W. COOKE.

of a modern anastigmat of medium aperture is usually an undulating curve which varies but little from the flat for an angle of seventy-five or eighty degrees, after which astigmatism, coma and curvature become apparent unless considerable stopping down is resorted to.

Until the last decade of the nineteenth century, when the great advantages of the wide variations of refractive index and dispersion of the new optical glasses were discovered, it was impossible to correct simultaneously for central spherical aberration, astigmatism and curvature of field because the condition necessary for the correction of astigmatism and curvature (the "Petzval condition") could not be met with the older glasses, when the conditions for correcting the central aberration were fulfilled. The old rectilinear was, therefore, a compromise between these errors.

We need say little of distortion, for it is a diaphragm error and is compensated in the rectilinear and other symmetrical lenses. It is present in singlets, when the diaphragm is used to a large extent in correcting or eliminating the other errors, but in the case of several of the modern anastigmats, distortion is not at all apparent, and the single combinations are perfectly suitable for architectural work.

Prior to the invention of the anastigmat, there were three important types of lenses, two of which have already been mentioned—the single achromatic, rectilinear and the portrait lens, commonly called the Petzval lens. The first two named were, in their various modifications, made to do practically every type of work except portraiture, where their lack of speed made them useless. It was quite common to use relative apertures of F/32 to F/64 in order to get fair marginal definition.

For portraiture the Petzval lens was very good indeed; its construction of eight surfaces (two cemented and six glass-to-air) made possible a flat, most brilliantly defined field of about twenty degrees, beyond which angle every error known to an optical system ran riot; all this at a speed of from F/3 to F/4. This was as rapid as could be used and still have sufficient depth of focus, while the narrow angle insured fair perspective. Its chief faults are that its definition is too keen for the finest of portraiture and its depth often insufficient,

Sidney V. Webb.

though these two failings have been greatly mitigated by so mounting the lens that the separation of the two elements of the back combination may be varied, thus introducing some spherical aberration, softening the definition and producing greater apparent depth. The angle of view is too narrow for groups or general work and the lens performs badly when stopped down to small apertures.

The earlier forms of anastigmat followed the lines of the rectilinear inasmuch as they were of symmetrical construction, each half being suitable for use alone. The singlets were made up of three or more elements which were cemented together, the corrections obtained by the additional surfaces and the new glasses being really excellent, the speed considerably greater than that of the rectilinear and the usable angle greatly increased. Development along this line has gone on until some marvelously effective objectives have been designed and produced. he writer can mention one lens of this type which works at F/6.5, covers a field of ninety degrees with a reflex undulating curve to the field, which is so near to the flat that it can, for many purposes, be used over the entire angle at full aperture. The singlets are of different foci and perform excellently at F/11. Another lens by the same maker works at F/4.6 or F/4.9 and is also of cemented symmetrical construction, the singlets working at F/8.5. This latter lens performs very well over an angle of sixty-five degrees and if stopped down slightly, will give definition which should satisfy the most exacting.

Attempts to attain greater speed and simpler construction have resulted in a multiplicity of anastigmats, partially or totally unsymmetrical in construction, most of which have six or more glass to air surfaces, one lens by a well known European firm having ten. The chief advantages of this construction are: (1) A glass-air surface allows greater compensation with less curvature than a cemented surface; (2) Such a surface may have any desired curvature, as it need not be the same as the contiguous surface of the adjoining lens; (3) The lens elements may be thinner, thus reducing slightly the absorption by glass; (4) The air spaces permit greater freedom of adjustment of the separate components and the objectives of this construction will vary less in their properties than those of cemented construction, where the slightest variation in the glass upsets the calculations; (5) Finer corrections can really be obtained by this construction; (6) The cost of manufacture is much less, both because of the smaller number of surfaces to be ground and polished and because the flatness of some of the curves permits a greater number to be ground on the same block; (7) Greater relative aperture can be attained by the use of glass-air surfaces.

These advantages carry with them some grave disadvantages: (1) An air space lens seldom covers over seventy to seventy-five degrees and often less, so that it is unsuitable for wide angle work; (2) Its separate components are either not suitable for use alone or only at apertures of F/16 or smaller; (3) Each time light passes from air to glass or glass to air about five per cent is lost by reflection so that aperture for aperture they are not quite so rapid as the cemented forms, the difference becoming quite apparent as the number of such surfaces increases for, while a lens of the cemented type should transmit about seventy-five per cent of the incident light to the plate, a lens with ten glass-air surfaces would transmit only about sixty per cent; (4) A part of the light thus reflected is sent back to the plate, where it either forms flare spots or tends to fog over the shadow detail. This would be noticeable only under unfavorable conditions, however; (5) The glass-air surfaces have a tendency to tarnish and collect a deposit which will degrade the contrasts of the image by scatter light and some of these surfaces are so mounted that they can only be cleaned by the makers.

For hand camera work there are air space anastigmats made, which will cover their own plates as perfectly as one might wish, at a price but little higher than that of a really good rectilinear. These work at relative apertures of from F/6.3 to F/8 and for film cameras or the usual plate hand cameras they are excellent, and it is only when an extreme rise or fall of front-board is to be used, or when it is desired to use the lens for wide angle work on a larger camera, that it would be worth while to purchase the more costly lens of the cemented symmetrical type. If, however, one has one of these de luxe hand cameras such as are made by some

AN OLD HOMESTEAD IN WINTER. DR. F. DETLEFSEN.

European makers, the best lens to be purchased at any price will be found none too good, as the writer discovered when using the entire two and one-half inch rise of front on a 3¼ x 4¼ Newman Guardia "Trellis" equipped with only a 5" lens. The lens was a Cooke Ser. III and had always done magnificent work under any and all conditions, but when this particular "stunt" was tried and the diaphragm set at F/16 to better the extreme marginal definition, we obtained nice black corners on the photograph which taught us thereafter to beware of stopping down a lens whose front combination is negative, lest the field of view be reduced.

For view and general or commercial work, in spite of the beautiful corrections of the newer type of lenses, there is no objective quite so suitable as the cemented symmetrical type, though for press work one of the more rapid air space objectives is an absolute essential.

For portraiture the old Petzval type is still deservedly popular, though several rapid anastigmats are now equipped with a simple device for softening their too-critical definition, which makes them entirely suitable not only for busts, but for groups as well as for general work out of the studio; this latter is an ideal lens for the home portrait and view photographer.

If the objective is to be used for telephoto work, it is of prime importance that the central corrections be most thoroughly carried out; in fact, the maximum circle of confusion in this part of the field, instead of approximating 1/500 inch, should be about 1/2500 inch; if telephoto snapshots are desired, it is doubtful if any lens is superior to the Petzval on account of its magnificent central corrections, though a few of the very best F/4.5 anastigmats will answer.

The perfect universal lens is not yet nor will be until more perfect glasses can be produced without variation, or until opticians perfect methods of grinding and polishing ellipsoidal surfaces. Then and only then it may be possible to produce an F/4.5 anastigmat which will give critical definition over an angle of eighty-five or ninety degrees. However, modern lenses are so near perfection that marvelous results can be obtained with them if the worker but understands their properties.

ENDING OF AN AUTUMN DAY. J. G. SARVENT.

THE VALUE OF THE METRIC SYSTEM IN PHOTOGRAPHY

By J. A. ERNEST ZIMMERMANN, B. S.

IT is a surprising fact, that workers in photography have not yet accepted the French or Metric system of weight and measure in their work. The claim for greater accuracy in the English system is highly lauded by its advocates and users. If the English system allows finer, more accurate, and most delicate measurements, why do our research departments at Washington employ the French system for their chemical and physical calculations and in their researches? The Metric system, which is based upon decimal quantities, is an orderly arrangement for measurements and not an arbitrary condition as the English system. Every worker in photography ought to, and should investigate this system to satisfy his own mind; for once the French system has been properly applied to photographic methods, other methods will be discontinued, due to its simplicity. We, Americans and other English-speaking countries, are the only civilized nations, who have not broken from the shackles of antiquity, and have not yet become progressive enough to make use of this better mode of measurement.

Chemists and physicists early recognized and realized the value of this system, and, employed it in their researches. It has also been the author's experience, that, the Metric system is far superior to the English system, both in his physical and chemical researches of photography; for photography is a physico-chemical process, which is a great deal more involved and complicated, than that which is known to the average worker of the art.

To the reader of the *Annual,* who may not be familiar with the system it will suffice to state, that, weight and measure can be used interchangeably, or that they bear a direct relation to each other, i. e., 1 cc* of water weighs 1 g** or 1000cc (1 liter)

* Cubic centimeter. **Gram.

THE END OF THE RAINBOW. L. A. GOETZ.

weigh 1000 g or 1 Kg***, while in the English system 1 cu. ft. of water weighs 62.45 lb.

Now, suppose it is required to make a ten per cent solution of potassium bromide. This can be prepared as follows: 10 g of the salt are dissolved in 90 cc or 90 g of water, and this will give a total of 100 g or 100 per cent, 10 parts of which are the salt, making the ten per cent solution required. Let us compare this now with the English system. Can ten ounces (dry) of the salt be used with 90 ounces (liquid) of water to make a ten per cent solution? Let us see. Following little mathematical calculation will show us: Since 1 cu. ft. of water weighs 62.45 lb.; 1 ounce, which is 2.172 cu in., will weigh 0.0785 lb. or 1.3 ounces. From this one readily observes that the English system is not suitable for making per cent solutions by using the weight or volume interchangeably, as in the case of the French system.

Then, too, the Metric system—since it is based on the multiples of ten—allows a greater freedom of choice. Thus 1 Kg (1000 g) of the salt would require 9 liters (9 times 1000 cc) of water for a ten per cent solution, while in the English system 1 lb. (16 ounces) of salt would require almost 21 ounces (liquid) of water. These few illustrations could be duplicated and triplicated without end to show the differences between the two systems.

Before closing, let us examine our weights used in preparing our formulae. The smaller weights of our sets (grain and scruple) are apothecary's weights—5760 grains to the pound, or 480 grains to the ounce—while the ounce weights and upward are based upon the avoirdupois pound of 7000 grains or 437.5 grains per ounce. From this it can readily be seen that the smaller weights allow a greater amount of material to enter the formula than the larger weights. Considering the above mathematical calculation, how are we to "make up" our per cent solutions, or compound our formulae? A tremendous amount of calculation and labor is required to prepare a solution or a formula, and, even then we are not certain if the computation has been performed and conducted without mistake.

*** Kilogram.

A MELODY OF PEACE. Herbert Irons.

BEDTIME. LOUIS ASTRELLA.

In order to do accurate work, all weights must be calculated as the grain in order to have everything on the same basis, while, in the Metric system, which is a decimal system, this need not be done—the only requirement for computations is to move the decimal point, either right or left, according to the requirement of the formula.

In very accurate weighings, the French system is superior, for it will weigh smaller quantities than the English system. Thus we have balances, that record a weight of 0.05 mg§ (0.00005 g), while the smallest weight, which the author has seen and handled, in the English system, was 0.5 grain (about 33 mg).

It is hoped that these few foregoing examples will give a clearer and better conception of the accuracy and ease of handling Metric weights and measures. Also that they will clear "up" a few vague misunderstandings, attributed to this French system. If the research departments of our Government has realized its value, and are using the system, why cannot we photographers use it too? For is it not only the best that is good enough for this art and science, which is yet in its infancy and can, and may be developed to a higher plane than has been heretofore possible.

§ Milligram

BLACK FEET INDIAN TEPEES. DR. A. H. CORDIER.

O. C. CONKLING.

PHOTOGRAPHIC QUALITIES

By WILLIAM S. DAVIS

EVERY medium of pictorial expression possesses certain characteristic technical qualities all its own besides such as may be shared in common by all. For example: in a water-color one looks for a greater degree of fluidity and transparency of color than in oil, while, on the other hand, the latter medium permits of great variation in surface-texture and boldness in the laying on of the pigment. In a pen-and-ink drawing the personal manner in which the artist develops his line-work is the first thing noticeable about the technique, this also being an important feature of an etching, though here a distinctive element is added by the processes of inking and printing the plate, which allows the introduction of some flat tones as well as a peculiar softness to the edges of the individual lines. Thus, examples might be cited in connection with all methods of graphic art, since each exhibits individual differences.

In these differences lie the latent possibilities in each medium which serve to balance limitations in other directions, and even the most casual survey of strong examples of work in any medium one might mention will reveal the fact that the artist has so handled his material as to utilize the characteristic qualities of the medium selected, thus forcing into the background, or entirely excluding, any of the limitations which in unskillful hands might be evident. In other words, the evident advantages are made the most of by not trying to force the capabilities of the medium.

To insure the utmost harmony in the finished work two courses are open to the artist—either select the medium best adapted to the purpose after the mode of treating the subject is decided upon, or choose material suitable to the capabilities of whatever medium it is preferred to work with.

Photography, when used for pictorial ends, is no exception to the general rule, and instead of trying to imitate any other

OCTOBER MISTS. WILLIAM. S. DAVIS.

means of expression the strongest elements of the process should be recognized and made much of, since an imitation, however clever, is never convincing.

The most characteristic photographic qualities seem to me to be the power of rendering minute and intricate details in their true scale, including, of course, representation of the surface texture of numberless kinds of material; the possibility of reproducing the most subtile transitions or gradations of tone; a peculiar quality of definition in a lens-projected image, capable of great variation as the result of manipulation in focusing, or the employment of special types of lenses. Whatever outstanding merits photography may possess as a medium for pictorial expression depends upon some of these qualities being present to a marked degree in the finished product and it is a great mistake to over-suppress or obliterate them from fear of making the result "too photographic". If one elects to employ the camera for picture making why shouldn't the result be photographic? A worker in any other medium would not be commended for attempting to camouflage the medium employed, so why not express enough confidence in the photographic print to let it stand or fall on its own merits. Of course I am not advocating using a camera, and going through with the after process in a mechanical manner—far from it—but I do believe there is ample scope for expression and pictorial accent through proper control without having to sacrifice the qualities which in a great measure constitute the charm of a photographic print.

If a subject at close range is filled with delicate and attractive detail do not be afraid to render it in the finished picture, for if the lighting is right sufficient massing of tones will be present to preserve breadth in the composition and prevent the details from being too insistent. On the other hand, should the interest center upon a tonal pattern rather than detail the result will probably be stronger for the suppression of minor detail by diffusing the definition in one or more of the planes, but even here one should at least think twice before going so far as to lose the differentiation between the surface textures of individual parts. Diffusion, of itself, however, will not improve tonality—that lies in the subject and the skill with which the scale from light to dark is kept

LADY IN FURS. OSCAR MAURER.

within the compass of the sensitive-film to record—in fact a diffused image to be agreeable calls for plenty of intermediate tones in the composition.

The texture of the printing paper employed, though not of itself a photographic quality, has an important bearing upon the matter under consideration, since it may enhance or destroy whatever quality has been secured in the negative. Especial care should be taken to avoid the use of very coarse-textured paper for prints of small or quite moderate size, as it destroys the characteristic quality of the lens-image. Where greater richness of surface than that afforded by the various silver papers is desired some one of the pigment-processes may be chosen, but the user should guard against the temptation to over-indulge in the almost unlimited personal control which most of them allow.

STADIUM, SAN DIEGO, CAL. J. L. NICOLL.

*"The breaking waves dash high
On a stern and rockbound coast."*

F. W. HILL.

MASKING ENLARGEMENTS

By HARRIS C. HARVEY

HAVING received many useful "tips" from the *American Annual* in the past, and having worked out a little time and labor saving scheme for my own use, I have thought it no more than fair to my fellow readers of the *Annual* to pass a good thing along.

Those who are in the habit of making enlargements for amateurs will readily agree that Mr. Amateur would rather receive his picture with a neat white margin around it than to have it trimmed to the edge, or possibly with the image of a push pin decorating each corner.

Now in the course of a day's work one finds many sizes and shapes of films, and the customer expects just as varied an assortment of sizes in the finished product.

Anyone who has experienced the annoyance of trying to pin a paper mask over a sheet of bromide on the easel appreciates the convenience of masking the film instead.

But here we find that the masks we used for contact printing will not always work well for enlargements. A customer may bring in any shape or size of negative and ask for an 8 x 10 enlargement. Or again they may have a 4 x 5 negative from which they desire an 8 x 14 panel.

When white margins first became popular I went to the trouble of cutting a set of paper masks for all the popular sizes of enlargements from 5 x 7 up to 16 x 20, but soon found that they were too flimsy to last, and that if I used a size larger paper and made them wider trimming the print afterward it was too expensive and a nuisance beside.

I then took up the proposition of masking the negative, and spent three days in a maze of fractions (not owning a slide rule) figuring out the proportionate sizes of masks.

The result will be found on the chart (Figure I). The top row of figures represents the sizes of enlargements usually asked for. The left hand column represents the

"Of wailing winds and naked woods and meadows brown and sear."

LAWRENCE C. RANDALL.

sizes of negatives to be enlarged. The number in the square at the intersection of a line from the negative horizontally, and from the enlargement size vertically gives the size of the mask necessary. I have avoided using fractions smaller than 1/8″, but in a few cases have used 1/16″ (this being the size of the regular Eastman Printing Mask for this particular size). I have also marked those sizes of masks which include the most of the negative in the finished enlargement.

Any good mask paper will answer, but I have found the Eastman Mask Charts the handiest and also most durable. These charts are ruled very conveniently with lines ⅛″ each

	$3\frac{1}{4} \times 5\frac{1}{2}$	4×6	5×7	$6\frac{1}{2} \times 8\frac{1}{2}$	6×10	7×11	7×12	10×12	8×14	11×14	14×17	16×20
$1\frac{5}{8} \times 2\frac{1}{2}$	$\boxed{1\frac{1}{2} \times 2\frac{7}{8}}$	$\boxed{1\frac{1}{2} \times 2\frac{1}{4}}$	$\boxed{1\frac{1}{2} \times 2\frac{1}{8}}$	$1\frac{1}{2} \times 2$	$\boxed{1\frac{3}{8} \times 2\frac{1}{4}}$	$\boxed{1\frac{1}{2} \times 2\frac{3}{8}}$	$1\frac{5}{8} \times 2\frac{3}{8}$	$1\frac{1}{2} \times 1\frac{3}{4}$	$\boxed{1\frac{1}{4} \times 2\frac{3}{8}}$	$1\frac{1}{2} \times 2$	$1\frac{1}{2} \times 1\frac{7}{8}$	*$1\frac{1}{2} \times 1\frac{7}{8}$
$2\frac{1}{4} \times 3\frac{1}{4}$	$1\frac{7}{8} \times 3\frac{1}{8}$	$\boxed{2 \times 3}$	$\boxed{2\frac{1}{8} \times 3}$	$2\frac{1}{4} \times 2\frac{3}{4}$	$\boxed{1\frac{7}{8} \times 3\frac{1}{8}}$	$\boxed{1\frac{7}{8} \times 3\frac{1}{8}}$	$1\frac{3}{4} \times 3\frac{1}{8}$	$2\frac{1}{8} \times 2\frac{1}{2}$	$1\frac{3}{4} \times 3\frac{1}{8}$	$2\frac{1}{8} \times 2\frac{5}{8}$	$2\frac{1}{8} \times 2\frac{1}{2}$	$2\frac{1}{8} \times 2\frac{5}{8}$
$2\frac{1}{2} \times 4\frac{1}{4}$	$\boxed{2\frac{3}{8} \times 4\frac{1}{16}}$	$2\frac{3}{8} \times 3\frac{1}{2}$	$2\frac{3}{8} \times 3\frac{3}{8}$	$2\frac{3}{8} \times 3\frac{1}{8}$	$\boxed{2\frac{3}{8} \times 4\frac{1}{16}}$	$2\frac{3}{8} \times 3\frac{5}{8}$	$\boxed{2\frac{3}{8} \times 4\frac{1}{16}}$	$2\frac{3}{8} \times 2\frac{7}{8}$	$\boxed{2\frac{3}{8} \times 4\frac{1}{8}}$	$2\frac{3}{8} \times 3$	$2\frac{3}{8} \times 3$	$2\frac{3}{8} \times 3$
$2\frac{7}{8} \times 4\frac{7}{8}$			$2\frac{3}{4} \times 3\frac{7}{8}$	$2\frac{3}{4} \times 3\frac{5}{8}$	$\boxed{2\frac{3}{4} \times 4\frac{3}{4}}$	$2\frac{3}{4} \times 4\frac{1}{4}$	$\boxed{2\frac{3}{4} \times 4\frac{3}{4}}$	$2\frac{3}{4} \times 3\frac{5}{16}$	$\boxed{2\frac{3}{4} \times 4\frac{3}{4}}$	$2\frac{3}{4} \times 3\frac{1}{2}$	$2\frac{3}{4} \times 3\frac{3}{8}$	$2\frac{3}{4} \times 3\frac{3}{8}$
$3\frac{1}{4} \times 4\frac{1}{4}$			$\boxed{3 \times 4\frac{1}{8}}$	$\boxed{3\frac{1}{8} \times 4\frac{1}{8}}$	$2\frac{1}{2} \times 4\frac{1}{8}$	$2\frac{5}{8} \times 4\frac{1}{8}$	$2\frac{3}{8} \times 4\frac{1}{8}$	$\boxed{3\frac{1}{8} \times 3\frac{3}{4}}$	$2\frac{3}{4} \times 4\frac{1}{8}$	$\boxed{3\frac{1}{8} \times 4}$	$\boxed{3\frac{1}{8} \times 3\frac{3}{4}}$	$\boxed{3\frac{1}{8} \times 3\frac{7}{8}}$
$3\frac{1}{4} \times 5\frac{1}{2}$			$3\frac{1}{8} \times 4\frac{3}{8}$	$3\frac{1}{8} \times 4\frac{1}{8}$	$\boxed{3\frac{1}{8} \times 5\frac{1}{4}}$	$3\frac{1}{8} \times 5$	$\boxed{3\frac{1}{8} \times 5\frac{1}{4}}$	$3\frac{1}{8} \times 3\frac{3}{4}$	$\boxed{3\frac{1}{8} \times 5\frac{3}{8}}$	$3\frac{1}{8} \times 4$	$3\frac{1}{8} \times 3\frac{3}{4}$	$3\frac{1}{8} \times 3\frac{7}{8}$
4×5			$3\frac{7}{8} \times 4\frac{3}{4}$	$\boxed{3\frac{3}{4} \times 4\frac{1}{2}}$	$2\frac{3}{4} \times 4\frac{3}{4}$	$3 \times 4\frac{3}{4}$	$2\frac{3}{4} \times 4\frac{3}{4}$	$\boxed{3\frac{3}{4} \times 4\frac{1}{2}}$	$2\frac{3}{4} \times 4\frac{3}{4}$	$\boxed{3\frac{3}{4} \times 4\frac{3}{4}}$	$\boxed{3\frac{7}{8} \times 4\frac{3}{4}}$	$\boxed{3\frac{3}{4} \times 4\frac{3}{4}}$

*8 x 10 can be made from same masks as 16 x 20.

Figure 1.

way. A sheet of glass, a rule and an old safety razor blade are about the only tools necessary.

As will be noted by a glance at the chart, there are several sizes of masks that will accommodate more than one size of negative and will enlarge to several different sizes. For instance: the mask 2⅜ x 4 1/16 will enlarge to 3¼ x 5½, 6 x 10, 7 x 12, 8 x 14, etc., and will accomodate both 2½ x 4¼ and 3¼ x 4¼ negatives. It is well, therefore, to place a gummed label on each mask and mark thereon the negative it is intended for, and the size or sizes it enlarges to.

I have found the handiest way to keep these masks is in an upright position in a partitioned box hung on the wall beside the enlarging bench. Each pigeon-hole is labelled with size, and all masks enlarging to that size are kept therein.

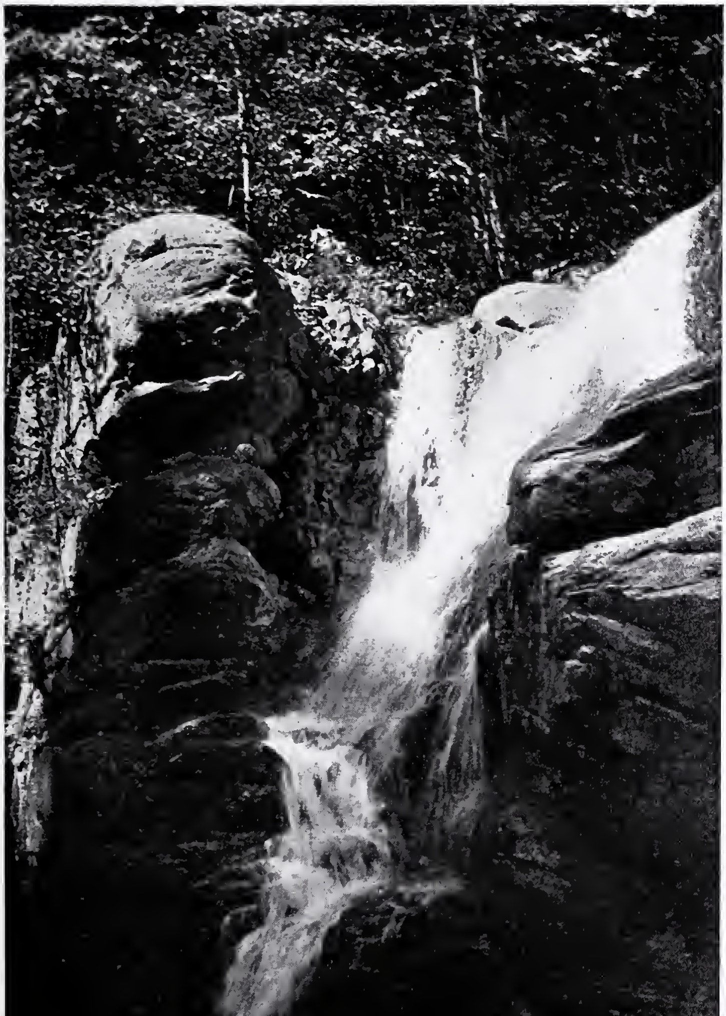
PORTRAIT OF AN OLD LADY. GUY SPENCER.

THE PHOTOGRAPHER AND NATURE

By A. H. BEARDSLEY

HOW many photographers ever stop to think what would become of pictorial photography if they could not turn to nature for subject-material? Of course, the practical, commercial, applications of photography are so varied that it would not die as an art and as a science; but I venture to say that without nature to turn to, the amateur and professional photographer would find it very difficult to produce pictures of interest and value to the general public. What would the pictorialists do without marines, landscapes, cloud-effects and woodlands? What would the nature-photographer do without studies of animal, bird and plant-life? What would the traveler and vacationist do without picturesque glimpses of foreign lands and beautiful scenery? To my way of thinking, in popular parlance, photography would be pretty well "shot to pieces" without nature to draw upon for pictorial inspiration. For this very reason, I make the plea in this article that every photographer should learn to study nature and to love the great out-of-doors; for, in all probability, most of his best work will be traced directly or indirectly to the inspiring influences of nature.

When the good editor of *The American Annual of Photography* heard of the subject I had selected for this year's volume, he wrote to me in part as follows, "With reference to the subject 'The Photographer and Nature', I do not know how you intend to handle this; but the subject is a good one, especially if it includes practical methods and formulae". So I set to work and before long obtained a formidable set of methods and formulae with regard to photographing nature. Then I read the article carefully. The more I read, the more it came upon me that I was burying the very heart and soul of the whole subject in a mass of methods and formulae that killed or stunted the growth of the real, vital issue. In consequence—and I hope with the



A FOREST WATERFALL.

Illustrating article "The Photographer And Nature," by A. H. Beardsley.

editor's permission for this time—I shall place greater emphasis on another side of the subject that seems to me to be fully as important. However, first, let me offer a few suggestions that I have garnered from the school of practical experience.

It is obvious that no matter how appreciative a person may be with regard to the beauties of nature, if he is unable to focus the camera accurately, make the correct exposure and develop the exposed plate or film, he cannot express in full measure his love of nature. Moreover, he should use a camera-equipment that is adapted to the work that he wishes to do; and in order to make a wise selection, he must know something of the various types of cameras, lenses and shutters on the market. The first step is to obtain all possible verbal and printed assistance from the nearest photographic supply-house. If a well-informed dealer is not available, a courteous, brief and explicit letter to the manufacturers of any standard type of camera, lens and shutter will bring a prompt reply. Each catalog and booklet should be read carefully and the verbal advice, pro and con, should be considered thoughtfully. Before an intelligent selection of a camera-equipment can be made, the photographer must come to a decision with regard to what branch of nature or pictorial photography he chooses to make his specialty. At the outset, he may as well know that there is no *one* outfit that will meet *every* requirement of modern photography. There are certain equipments that will meet a number of requirements and others that are specifically designed for one purpose only. It is a waste of time, energy and money to experiment. Unless the camerist can make up his mind definitely with regard to what he wishes to accomplish, he had better postpone the purchase of an expensive outfit until he is able to make a positive decision.

For the benefit of those amateurs who are still striving to find their particular field in photography, let me call attention to the many excellent models of moderate-priced cameras that use roll-films, film-packs and plates. These cameras may be obtained ready equipped with meniscus-achromatic rapid rectilinear, F/7.7, F/6.8, F/6.3, anastigmats and other lenses of moderate speed. The shutters usually supplied

MID DAY. Lawrence C. Randall.

with these cameras are well adapted to the particular type of lens used. Some of these cameras are fitted with a double or triple-extension bellows, and this is a distinct advantage in nature or pictorial photography. With regard to the size of the picture, I would suggest nothing larger than 5 x 7 or smaller than 3¼ x 4¼. Where it is possible, a symmetrical or a convertible lens should be selected, especially if the camera has a double or triple extension. Those cameraists who may possess slender purses may rest assured that they may do excellent work with a meniscus-achromatic or rapid rectilinear lens. Although I always advise the purchase of the best possible lens within the financial limitations of the worker, I concede readily that some of the best nature and pictorial pictures that I have seen were made with cameras and lenses of moderate price. After all is said and done, it is not the camera-equipment but the man who uses it that is responsible in most cases of failure.

The cameras that we have been considering are well adapted to landscapes, marines, flower-studies—by using a portrait attachment—and to the simpler forms of general nature and pictorial photography. By that I mean that the camerist can make pictures of certain birds, small animals, insects and flowers. He can also test his artistic strength in pictorial photography. However, he should not attempt —except in rare cases—to photograph birds on the wing or animals in rapid motion. For such subject-material the camerist requires a reflecting-camera that is fitted with a standard high-speed F/4.5 anastigmat lens. Although I have seen remarkable pictures of birds on the wing and animals in rapid motion made with ordinary pocket-cameras, I believe that to obtain consistent results the worker should use a reflecting-camera. There is no gainsaying the tremendous advantage of being able to watch the subject on the ground glass up to the instant of exposure. Another signal advantage is the fact that the image is right side up; and, with practice, any degree of sharpness or diffusion of focus may be obtained accurately. Obviously, this sharpness or diffusion of focus is not the same thing that is obtained with soft-focus lenses and should not be so confused. Without a doubt, the reflecting-camera is the best outfit for the worker who delights to "hunt with the camera" and who goes after large and small game wherever it may be found, and under all conditions of weather. Most cameras of this type offer the photographer a choice of dry plates, film-packs or roll-films to be used as each subject may warrant and transportation is safe or filled with risk. Reflecting cameras—even the most compact of them—are not light in weight in proportion to the size of picture that they make. However, I believe that the advantage of being able to watch the subject accurately on the ground glass—right side up—more than offsets the inconveniences of weight and bulk.

Most camerists prefer that side of nature-photography which offers a certain amount of excitement; but there are many that are as much interested in the study of the cell-life of plants and animals, the ingredients of a drop of water, the eye of a fly or the larvae of a mosquito. For such work a pocket outfit or reflecting-camera is not very well adapted, although certain models of hand-cameras may be used. The most satisfactory equipment is a double or triple-extension plate-camera to which may be fitted whatever objective or microscopic equipment that is needed for the work in hand. A satisfactory source of illumination must be found and other accessories obtained in order to pursue this fascinating branch of photography successfully. Before beginning to assemble an outfit for this purpose, the worker will do well to consult the manufacturers of photomicrographic apparatus in order to ensure the best results in the special work he may wish to do. That part of nature which is invisible to the unassisted eye is fully as marvelous as that part which all may see. Those camerists who have used their photomicrographic equipment intelligently and successfully are most enthusiastic and fascinated by the wonderful things that are disclosed by the microscope and photographic lens.

In a sense, a corollary to photomicrography is telephotography—both employ optical combinations which enlarge the subject in order to make visible that which otherwise would not be seen by the unassisted eye. It is to be regretted that there is not more general interest in telephotography. This is especially true with regard to landscape-photography. How many times have we all stood upon a mountain-top and be-

AN OLD COUNTRY ROAD.

Illustrating article "The Photographer And Nature," by A. H. Beardsley.

held with delight the panorama spread before us, and have made a picture of the scene with a hand-camera only to be disappointed bitterly at the result. Those majestic mountains seemed to have sunk into the earth and their grandeur to have been lost completely. A telephotograph of the same panorama would have concentrated the interest and retained, in a measure, the proportionate height of each mountain. Of course, some relief may be found by using the single combination of a symmetrical or convertible lens; but usually this does not afford more than a two-time magnification. A hazy atmosphere and a brisk wind are two difficult problems for the telephotographer to solve. A double or triple-extension plate-camera is essential in most cases, although there are several tele-objectives which may be used successfully with a short bellows-extension. The making of telephotographs often necessitates much physical labor and infinite patience. The camerist who surmounts all obstacles and manipulates his equipment intelligently will obtain results that, technically and artistically, will become a joy forever to himself and to his friends. The worker who seeks the easiest way out of a difficult photographic situation should not attempt telephotography; but, if he is willing to stick to it until he "arrives", he will find a boundless element of satisfaction in the task.

At this point the reader may say to himself, "All this is very well; but he gives no formulae, mentions no outfits in detail, has no drawings and confines himself to generalities. What practical value has this article, anyhow?" Let me refer the inquirer back to the second paragraph in which I offered explanation for the course I have taken. I admit readily that figures and drawings are lacking; but I am not so sure that the article is not practical because they have been omitted. Few of us can do our best work unless we have a certain amount of vision. That is, unless we can lift our eyes from the task at hand long enough to catch a glimpse of something higher and better than ourselves and our activities we are apt to get in a rut, and to lose that fire of ambition that spurs us on to better things. There are many camerists who make wonderful pictures technically but whose work lacks heart and soul. It was said of a

EDNA LEIGHTON TYLER.

famous violinist that his technique was flawless and that all he needed was to fall in love to become the greatest musician of his time. So it is with many photographers. Their minds are so obsessed with chemical formulae developing-agents, toning-solutions or enlarging-apparatus that they have failed to catch the larger vision of nature and hence fail to move the heart and mind of him who beholds their pictures. My plea in this article is for camerists to attune themselves to those things which will lift them and photography to higher planes of thought and action. Too idealistic and visionary, you say. Perhaps; but what great achievement in art or science was ever consummated without first the vision and then the realization? In nature, the amateur and professional photographer can find an inexhaustible source of the purest inspiration that this world affords. Is it visionary or impractical to advocate tapping the source of artistic inspiration and financial realization? The photographer who loves and understands the great outdoors is attuned to a dynamic, inspirational power that will not fail him, and that will bring him success in exactly the proportion that he puts into practice what he learns.

It does not follow that because I urge the camerist to study nature that he must go far afield. On the contrary, some of the most satisfactory subjects may be found close at hand—even in the camerist's own garden or in a nearby park. The first step is to cultivate the ability to observe accurately. It is not enough to say that one saw a bobolink. One should be able to tell its size approximately, describe its white and black markings and know its rollicking song. The same statement should apply to any animal, bird, insect or reptile that one chances to meet. Then, there are the flowers and trees, too, that require accurate identification. In this connection I cannot help but refer to that remarkable article, "In Nature's Studio" by Dr. J. B. Pardoe which appeared in one of the monthly photographic magazines. Dr. Pardoe is an excellent example of an amateur who has put into practice successfully the very things that I am trying to emphasize in this article. He has the vision and likewise the practical qualifications to make his vision live and be a joy to the rest of us. A general knowledge of cloud-form-

THE SONG OF THE BROOK. KATE MATTHEWS.

ations and metereological conditions will prove to be of immense value. Again the reader is asking what all this has to do with photography. Let me assure him that it has much to do with it. By cultivating an accurate knowledge of nature, the photographer attunes his heart and mind to the grand symphonies of the great outdoors, and thus is enabled to portray pictorially the beauties of the sea, mountain and forest.

My plea for accuracy in making observations of nature is based on the need to have pictorial representations of nature true to life. Also, to name a tree, flower or animal correctly often adds to the appeal of the picture. As a case in point, let me refer the reader to that beautiful poem, "To a Lone Fir" written and illustrated by Alexander Dawes DuBois, which appeared in one of our photographic publications several months ago. The scene depicted was one of desolation. A steep, fire-swept mountain-side greeted the eye; and a setting sun was obscured by the dark and foreboding clouds of an approaching storm. Standing alone amid the burnt and twisted trunks of its fallen brothers of the forest, stood a giant fir-tree—majestic, strong and wonderful. In solitary splendor and courage it faced the approaching tempest that might tear it down and send it crashing down into the valley below. Does the reader suppose for a moment that Mr. DuBois could have written and illustrated his poem if he had not been attuned to the grandeur of the scene before him, and been aware of the tremendous dramatic appeal of the lone giant fir on that fire-swept, desolate mountain-side? Moreover, if he had mentioned merely a large tree instead of the *fir,* much of the literary and dramatic appeal would have been lacking because the student of nature, knowing the habitat of the fir-tree, could appreciate the desolate character of the surroundings of the fir in the poem. A further illustration of the value of accuracy, and likewise the absurdity that may occur through ignorance or carelessness, is to portray a hot-house rose in a vase and label the picture, "From the Heart of Nature"! Conversely, to make a photograph of a Lady's Slipper on a library-table and call it "The Florist's Favorite" would be an insult to any observer who knows the secluded character of the or-

THE SUNDAY NEWSPAPER. Clarence H. White.

chid's habitat—deep in the woods. The photographer who understood and loved nature would be incapable of such a blunder. Even if his mind said yes, his heart would say no.

It should be evident to the reader that a sound rudimentary knowledge of the ways of animals, birds, trees and flowers is of much practical value. The ability to observe intelligently and accurately will enable the camerist to plan and to execute his outdoor photographic work to advantage. It matters little whether the subject is a landscape, mountain-peak or placid lake. From his store of nature-lore, the photographer will be able to portray with his camera that which he *knows* to be true to the beauty and grandeur before him. Some one has said that nature is always beautiful. By this is meant that, if the camerist comes upon a group of flowers at the roadside, he will find the flowers so arranged with regard to color and composition that they will blend harmoniously with their immediate surroundings. This is an open question. However, the fact remains that fidelity to nature as he finds it, *not* as he would wish it to be, is the photographer's surest way to success.

The reader may wish to know, for example, how the ability to describe a meadow-lark will help him to make a good picture. Let me explain. To be able to describe a meadow-lark from actual observation, a person must go to the meadow-lands. If he is even ordinarily interested, he cannot fail to see and hear many things of which he has meagre knowledge. The fact that he does know, is very apt to arouse his curiosity. Once that his curiosity is aroused, he will bend every energy to satisfy it; and, in so doing, he will absorb unconsciously a large amount of information. The result is that he grows to love the quiet meadow-lands, to note the play of light and shade across the waving grasses and to wait for suitable cloud-formations to heighten the pictorial effect. Incidentally, he has seen the meadow-lark at rest and on the wing and knows its beautiful song by heart. The whole experience has aroused the person's finer and more spiritual self. He has become attuned to the symphonies of the free winds of Heaven who acknowledge no control save that of the Master-Mind.

Perhaps the reader is now inclined to think that I am striving for an effect. I am; but for the benefit of the photographer—not of myself. If I can arouse every camerist to realize what it will mean to him to know and to love nature, I have achieved the effect that I desired. My plea is neither new nor original. The basis of all true art is the human heart. If it pulses in harmony with the beautiful things in life and in nature, its possessor is enabled to mold by tongue, pen, chisel, brush or camera the hearts and minds of those less fortunate than he. When I stop, for a moment, to think of the infinite pictorial possibilities which lie in nature, I am amazed that any normal man or woman can remain unmoved by the appeal. However, there are those who need a kindly hint to avail themselves of opportunities close at hand. During the coming months of 1921 there will be thousands of amateur and professional photographers who will be out with cameras trying to portray what they believe to be beautiful. Then, it will become apparent who among those thousands has learned to know and to love nature. In one picture there will be reflected the heart of the maker; in another the coldness of one who "has eyes but sees not, and ears but hears not". The still, small voice of the great outdoors is a wonderful thing to know. The camerist who begins now to listen for it will find that in so doing he will become a better, more sympathetic and truer man. It may never become apparent to the layman; but to the lover of nature and photography it is self-evident that to make beautiful pictures the photographer must first have the love of beauty in his heart.

LIGHT AND SHADE. A. W. DREYER.

THE ROADSIDE BORDER.

Illustrating article "Studying Ferns With The Camera," by A. E. Davies.

STUDYING FERNS WITH THE CAMERA

By A. E. DAVIES

"Nature made ferns for pure leaves,
to show what she could do in that line."

THOREAU.

OF nature's many subjects that attract the attention of the camera enthusiast I have noted but scant attention being paid to one of the most beautiful and attractive, namely ferns.

As a specialty ferns afford opportunity for many months' work, not only in search for different species, but in the portrayal of the same plant at different times of the year, showing its development and life. As a subject for an occasional day's jaunt every successful study of our ferns is bound to be a valuable addition to one's nature album.

The worker with the Kodak has even chance with the more serious worker who carries a larger, back focusing box, as enlargements from parts of a negative not alone bring a subject up to a better size for viewing, but the angle of view is made

PORTRAIT OF A YOUNG MAN. IRVING BERKEY.

A TROPICAL SPECIES OF GIANT PROPORTIONS.

narrower, thus accomplishing better depth and more natural perspective.

As the subject of individual studies of ferns occurs one may find that he already has negatives from which such studies may be made. As an illustration of this "The Roadside Border" is a print made from a discarded negative.

The negative is one of two that were made on an all day hike with my 5 x 7 box and a load of plates. The day, although bright in the morning, turned cloudy and later showers set in at most regular intervals. In fact, every time I got my camera set up it rained a little more. During the day I made two exposures. One of these turned out to be a fair negative, but the other had everything the matter with it that it could have. The greatest trouble, however, was a most aggravated

A PORTRAIT. F. MILTON ARMBRUST.

case of halation. Although this negative was filed at the time, it was later weeded out and heightened a pile of old plates to be used for glass. Several years after this I was cleaning off some of these old plates and I again came across this negative. It is now back in the files with a corner of it marked off for the fern study it contains.

For the photography of ferns one of the most essential things is a soft, even light. With few exceptions ferns are lovers of shade, and on a bright day their leaves may be blotched with spots of sunlight. While not unpleasant to the

Illustration.

eye this hardly photographs well, and early morning, or late afternoon, when the expanse in which you are working may be in shadow is good, but best of all is a light cloudy day.

Very early morning has the advantage of besides being a soft light, often calm, and this lack of wind to move the fronds allows for comfortable exposures. Whatever lens you may use in making close up studies of ferns it will be necessary to stop down to quite a small opening, as the length of the average fern leaf requires that you increase the depth of focus of your lens to its greatest capacity in order to have at least part

THOMAS HARDY. E. O. Hoppé.

of the leaves of the plant sharp. Stopping down the lens, of course, allows less light to pass, and exposures must be long enough to give full details in the shadows.

When making studies of parts of a fern leaf, or small fronds, it is permissible to use some sort of an artificial background, as the mass of surrounding detail oft would detract from the subject while the plain background would tend to emphasize. However, for the most part when making studies of the whole plant from a little distance, or even close up, wherever possible make use of the natural background.

An album made up of only fern pictures makes a most interesting and individual collection. Pictures of different ferns, also showing parts and different stages of the same plant, may be arranged in their proper order. The making of such a book may be made an unending pleasure, as it is never complete, and every trip with the camera may be made with a definite object.

In connection with such a collection of pictures the story of one of the means of propagation of ferns will not be amiss. Although there have been many erroneous impressions as to the generation of new ferns the way it is really accomplished is as follows: About midsummer there appears upon the underside of the mature fronds of most species small fruit dots. These dots are made up of tiny cases containing spores. These spores may be likened to the more familiar plant seed only in so far as they serve to carry the species through a resting stage.

At maturity these spore cases snap open and scatter the spores upon the wind. If a suitable location is encountered they soon germinate, not however giving rise to a plant like the parent, but instead to a small, green, heart shaped body, flat and not more than a quarter of an inch across. On the underside of this two sets of organs are borne, and finally by a union of their contents a new fern is produced. All this takes some time and a fern may not come to maturity before from three to seven years. When we consider all of these steps necessary to the growth of new ferns most of us have hardly half enough respect for them and the beauty they add to nature's garden.

There are many books one may get to assist them in the identification and study of ferns, but the one that has been the most help to me is "Our Ferns in their Haunts" by Willard N. Clute.

COMPOSING THE PICTURE

By EDWARD R. DICKSON

DO you remember Thackeray's observation that artists are those enviable people who can see fairies when others see only what is abundantly commonplace and familiar? And do we not also know that although such fairies may be seen by these artists, it is a fact that among them are those who see fairies of inferior rank? Now, what are we in photography going to see? The most beautiful and the most fantastic of these fairies, of course! Priming ourselves with an eagerness for knowledge, we are going to use our eyes as observatories for what we want to know, and thus overcome our artistic blindness. It is all a matter of ambitious intent, and the pictorialist who desires to express himself is ambitious; since his work is largely contained in an endeavor to make appropriate assimilations of photography and art. But in order to make these assimilations, we are compelled to give consideration to pictorial structure.

Take the matter of landscape photography. We know that the worker who goes to nature must regard her sympathetically; and since his motive is an exalted one, he must withdraw her from the external reality of her sunlit home into what may be termed an idealized imitation of that part of her which has impressed him most. With his lens he must summon to a crystal birth such tumultuous emotions as he can synthetize into a pictorial unit. But frequently, the photographer is disappointed. For instance, after many months of study in the analytical exercises of paintings, he will go into the fields, regretfully returning without finding a photographic similarity or parallel of what he has been studying. Were he to make a study of forms and shapes and then construct these on his plate, there would be no need for such photographic parallels to cause disappointment.

I am attaching a photographic exercise (Figure 1) which I made with a view to determine therein the presence of cer-

Figure I.

Illustrating article "Composing the Picture," by Edward R. Dickson.

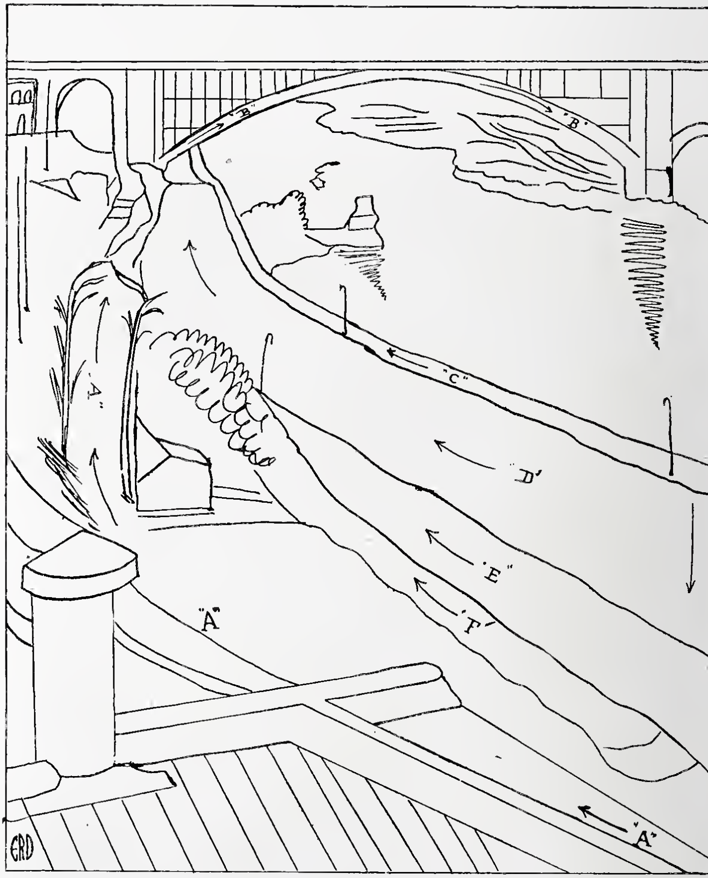


Figure 2.

tain geometric shapes, and I am leaving the reader to find out how many triangles and triangular shapes it contains, while I endeavor to show that by appreciating and recognizing such an oblique line as that which lies at the left of Figure 1, a composition from a most unusual viewpoint has been made through its use, which you will observe in another picture.

If we look at Figure 2—which is an outline of the composition "The Speedway"—we will notice the employment of a similar oblique line entering the picture at "A," and through

THE SPEEDWAY.

Illustrating article "Composing the Picture," by Edward R. Dickson.

the use of this line we may analyze this picture as follows:

Beginning at "A" a swift entrance is made leftward, passing the vertical ventilator, touching the trees and, arriving at the curve, pass this line until "B" is reached. The downward tendency of the reflection is an aid in reaching the vertical note of the lamp, and, still descending, we pass out of the picture at "A" again.

Now look at area "D," "E," "F," and note how they are assisting in the pictorial digestion by leading in the direction which takes the eye to the beginning of the curve. And what an unusual shape is afforded us by following the lines "B" and "C" in their curvilinear suggestion! Let us suppose that an abundance of sunlight was enveloping the lower left of the picture. Our pictorial scheme would then become riotous with every element in it craving equal attention at the same time, and the eye in its bewilderment would not know where to go. But having this lower left in subdued lighting, this part is made to function as a balance for the upper part of the picture, and allows the bridge to maintain a greater degree of interest. You will observe also that the ventilator, the trees and the stairs all lead to the bridge and its curve.

On taking a walk enjoyable to one's aesthetic sense, not only does one take delight in the objective of the walk; but also in the contributing points of interest which lead to this objective. And it is the same with the pictorialist who includes in his picture such intervals of minor importance as are necessary for the enjoyment of the eye before the greater emphasis has been reached.

These are some of the tools with which the pictorialist work. They have nothing to do, however, with his self-preservation from spiritual disintegration. That is another matter. Keen-eyed from within, to all this he has to add the ripeness of such poetic emotions as may enwrap him in moments of frenzied and beautiful experiences.

WHERE THE ROAD TURNS. EDGAR A. COHEN.

KATE SMITH.

THE PAPER NEGATIVE

By T. W. KILMER

MUCH has been and will be written of the paper negative. The many methods of producing paper negatives will not be dwelt upon. It is my desire only to put forth a certain routine which it has been my pleasure to follow with certain small negatives. We all of us have a few small anas-

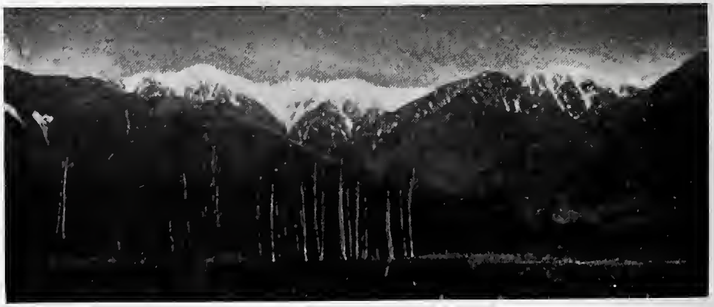
Enlargement From Small Anastigmat Negative.
Illustrating article "The Paper Negative," by T. W. Kilmer.

tigmatic negatives lying about probably with which we have done nothing of any account. Many a great masterpiece was not recognized as such until seen upon the enlarging easel, or until a large print was made therefrom.

Enlarge these small negatives in their entirety, or small portions of the negatives, until you have a picture the composition of which pleases you. Enlarge it in the ordinary way, upon thin matt paper. Take this enlargement, place it in your printing-frame against the glass with its picture-side down. Place in contact with the enlargement one or two thicknesses of celluloid, depending upon the amount of diffusion you wish in your finished product.

Place next the celluloid, a piece of the same thin, matt paper (which you used for the enlargement). Expose to daylight some ten to twenty seconds, and develop. You will now have a paper negative. This paper negative can be worked up ad libitum with pencil, crayon, or crayon sauce and stump, or you need not work it up at all. Put the paper negative thus obtained, in the printing-frame, and from it by contact make as many prints as you wish, on any kind of paper that suits your fancy.

Thus you have a comparatively easy way of procuring a soft print, which at times is hard to tell from a gum. Try a few paper negatives of your last little negatives, made after the above method and see what an agreeable surprise awaits you.



K. KAJIWARA.

Contact Print From Paper Negative.

Illustrating article "The Paper Negative," by T. W. Kilmer.

RETOUCHING AND RETOUCHING APPLIANCES

By A. LOCKETT

MOST photographers regard retouching as a necessary evil. Its necessity allows of little argument, but the evil may be questioned. Certainly, handwork on the negative is sometimes overdone, but things are much better in this respect than they used to be. The demand for a marble-like smoothness, destructive of real likeness and animation, is fast dying out. A minimum rather than a maximum of pencilling is now aimed after, and the retention of those marks, lines, and dints with which the chisel of time gradually puts character and expression into every face, is now not only tolerated but insisted on, it being merely stipulated that the exaggerated candour of the camera shall be softened and toned down.

The amateur usually fights shy of doing his own retouching, from a mistaken idea of difficulty. Admittedly, the expertness of a professional artist cannot be attained without much practice and experience, to say nothing of the native skill required; but, short of this, there is much that the amateur can readily learn to do, both to his own satisfaction and that of others. In the present article, a number of practical hints will be given on the subject, which, it is hoped, may be of use both to the tyro and to those who make retouching their life-work.

In the first place, one must have a retouching desk, on which to support and illuminate the negative. The old type of desk with a hinged flap at top, hooded at each side to keep off stray light, cannot be recommended, either on the score of comfort or health. It gets very hot for the head, especially in warm weather, and the supply of fresh air is objectionably inadequate. A better plan is to use a desk (A) without top or hood, as shown in Figure 1, place it close up against the window, and secure the requisite exclusion of light from the film side of the negative by having a card or opaque frame with a square opening (B) to block out the lower part of the window, except just enough to illuminate the desk reflector (C), while a sufficiently dark spring blind (D) is pulled down over the upper portion. By leaving the top of the window well open plenty of air will be obtained, to say nothing of what comes in by the

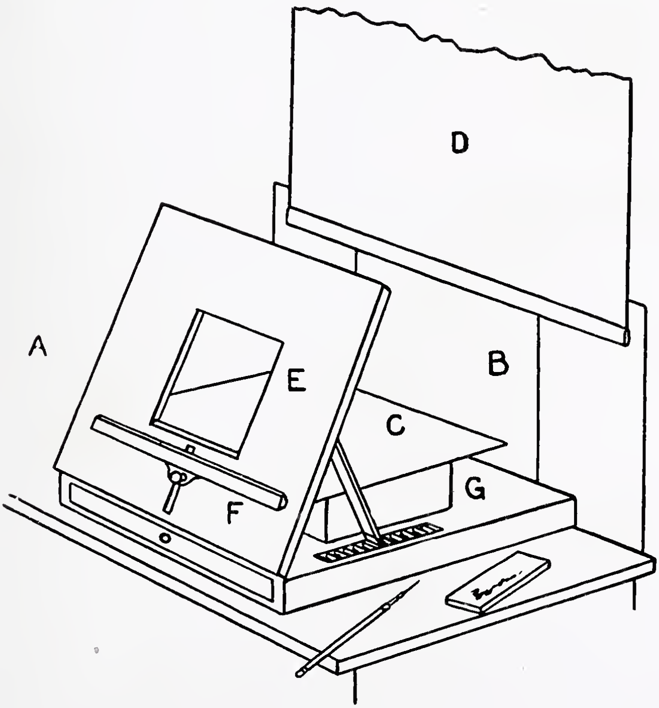


Figure 1.

door, and the head can be kept delightfully cool. The frame and blind are readily shifted when the desk is not in use.

A large desk is much to be preferred to a small one, since it reduces the need of stooping and more effectively excludes stray light, besides accommodating different sizes of negatives. It should have a rectangular opening (E), over which the negative is supported by resting on an adjustable bar or ledge (F), which can be clipped or clamped at any desired height or angle. There are differences of opinion as to the best way of throwing the light through the negative, but, to the writer's mind, there is nothing better than a sheet of smooth white cardboard, such as that used for pen and ink drawings. A sheet of this, about 10 ins. by 8 ins., should be supported horizontally on a small box (G) stood behind the negative opening, an inch or two below the bottom of the latter.

Retouching should preferably be done by daylight. Work executed by artificial light is never quite so good, nor so certain in its printing effect; moreover it is slower. If one must retouch at night or on dark days, then, curiously enough, the old-fashioned petroleum or paraffin lamp seems to be the most satisfactory illuminant, though sometimes undesirably warm. A sheet of thin, grainless white paper should be pinned at the top of the desk to hang straight down in front of the lamp; or, for some negatives, two sheets may be used. Occasionally fine ground glass is an improvement. Opal, as a rule, is too opaque. A good two-wick lamp should be selected, and only the best oil burnt. It is a notable advantage that the amount of light can be adjusted readily at the source itself, which cannot be done with electric bulbs. The incandescent gas mantle gives a very good light, but is not so conveniently fitted, nor so readily handled, on account of its fragility.

Those who prefer to be up-to-date, at all costs, should use metal-filament electric bulbs rather than the carbon kind, which latter give an unpleasantly yellow light, deceiving to work by. It has been objected that, when alternating current is installed, metal-filament lamps are especially bad for the sight. This may be so, but certainly the writer has never noticed any ill effects in his own case. What is more probable is that electricity of any kind is a trying illuminant for retouching, and that those who have complained of alternating current really have weak eyes, and would find continuous current just as bad. This is, of course, assuming the periodicity of the alternating current to be reasonably high. One can quite understand that a very low periodicity, giving rise to a perceptible flicker, would be injurious, even to the strongest eyesight, in work requiring close application.

BELLE JOHNSON.

For occasional night retouching, a bromide printing machine may often be employed, by placing the negative in the rebate at top with a sheet of ground glass behind it, darkening the room, and switching on the bulb inside the printer.

The leads for retouching should be of the very best quality. Three different degrees are quite sufficient, a hard medium, and a very soft. The bulk of the work will be done with the medium lead. A pad of the finest glasspaper is wanted for sharpening purposes. A long, almost needle-like point should be obtained, by holding the pencil nearly horizontal and rubbing it to and fro along the glasspaper, at the same time slowly rotating the holder between the thumb and forefinger.

Figure 2.

There are many kinds of medium or "dope," and it is as well to try several, and to select that which takes the pencil most readily and seems best to suit the worker's touch. It should be applied in a circular rubbing movement with a silk rag just moistened from the end of the cork, after shaking the bottle. Only enough should be used to give a distinct shininess, and care should be taken to blend away the edges, so that a mark does not show at the margin of the medium, lighter than the rest of the negative.

For first attempts, get hold of a portrait negative showing a few freckles and unevennesses. One recently taken and not previously retouched is best, others being more trouble to work on. If retouching is already present, clean it off with turpentine, or with a little of the medium.

SUNSPLASHED. Edgar N. Poole.

Small transparent spots will do to begin on. Approach the pencil very gently indeed to the exact centre of the spot, and make a circular movement with the point, when, if properly done, the spot will instantly disappear. Figure 2 shows, on a greatly enlarged scale, the kind of touch for filling in a spot; only it must be remembered that, in actual work, the pencilled spiral will be closer together, so that the lines practically blend into a single dot. Take care not to get the pencil outside the spot, or a black mark will be made at the edges instead, and the spot merely rendered more conspicuous.

Larger spots may be filled in by a kind of combined circular

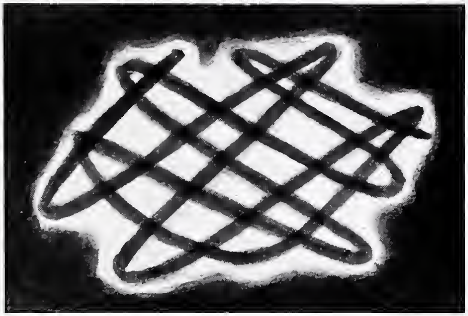


Figure 3.

and zigzag movement of the pencil, as suggested, much enlarged, in Figure 3; always taking care to put the work only where some part is lighter than the surroundings, and avoiding other parts. By continuing to do this, any uneven-looking or patchy portion soon gets even and smooth. One must not, however, work in too small and minute a style, while the head should be kept as far away from the negative as it is possible to see from, so that the general broad effect is viewed, rather than the microscopic details.

Where necessary, gaps may be filled in by single curved strokes, or by stippled dots, as illustrated on a smaller scale, but still larger than would be the case in real work, by the dark background in Figures 2 and 3. A pleasing grain is obtained by these means.

Take a rough and fairly deep print now and then, on a small piece of glossy paper, to see the practical result of the pencilling, and that it does not make itself too self-evident and scratchy. If it is, remove the work and begin again with a gentler touch.

High lights on the temples, the bridge of the nose, at the nostrils, on the chin, or in the eyes, may be heightened cautiously, or inserted if absent, with the soft pencil.

Figure 4 is a print from a typical unretouched negative, Figure 5. It will be seen that the latter is somewhat underexposed, and the shadows therefore too heavy. Notice the deep lines under the eyes, the exaggerated cracks on the lip, and the bony effect of the neck, all of which are quite unjust to the original. In Figure 6, a print from the same negative after being retouched, all these faults have been amended, the teeth have been rendered more natural, the lip filled up, the throat and shoulder smoothed, the whole face rounded, the high lights strengthened, and the untruthful results of a scanty exposure, and perhaps rather bad lighting, thereby checkmated. Figure 7 shows the appearance of the retouched negative.

It should be stated that the negative examples have been printed by contact through the unmounted positive proofs, which explains a slight granularity, chiefly in the background. They give, however, a very good idea of the two aspects of the actual negative.

By closely studying rough prints of his work, and pitilessly comparing it with that of others, the would-be retoucher will soon make gratifying progress. If, however, really first-rate excellence is wished for, he should get one or two text-books on the subject, and, if possible, take a few finishing lessons from an expert. When quite at home with hand pencil work, an electric pencil may be obtained, which will result in an increase of speed and lessened labor.

As soon as good smooth pencilling can be done, invisible on the print except by its effect, an attempt may be made at using the knife. This puts in shadows, whereas the pencil puts in lights. Different kinds of knives are sold for the purpose, which can be kept sharp by rubbing on an oilstone, without using oil. Remember that the action of the knife should be a scraping one, removing the film in what is almost a fine

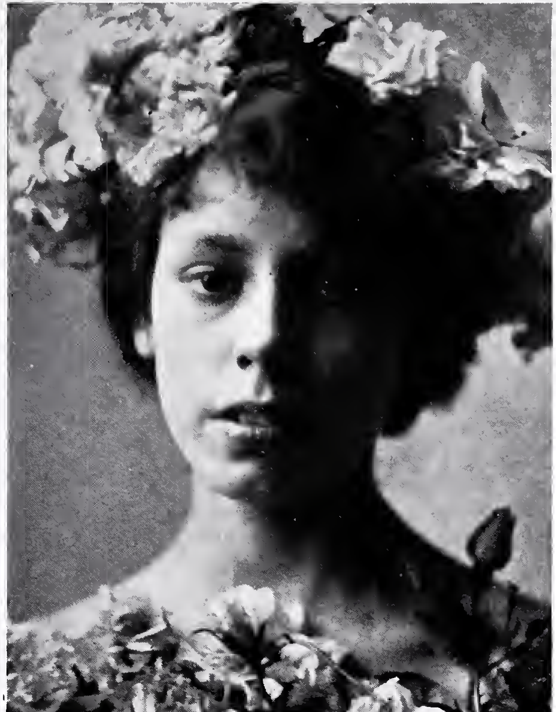


Figure 4.

PRINT FROM UNRETOUCHED NEGATIVE.

Figure 5.

UNRETOUCHED NEGATIVE

Illustrating article "Retouching and Retouching Appliances, by A. Lockett.

black powder, rather than cutting right through it. The ideal should be to scrape away only sufficient to print satisfactorily, without producing a mark lighter than the surroundings, that needs partial filling in afterwards with the pencil or brush. Knife-work is, of course, of comparatively limited application, but is often useful for reducing a too-plump cheek, a double chin, or a rotundity of waist, straightening bent noses, thinning those that are too wide, and for taking out false lights, or even a squint, in the eye. Mention should not be omitted of the special erasing pencils sold under the name of "Negafake," which many find much easier to use than the knife.

In conclusion, one cannot but express mild surprise at the opinion which would totally condemn retouching, as a departure from Art and a descent to the mechanical. According to all logical definitions of the artistic and the mechanical, it is undoubtedly the exact reverse. Retouching may be a backsliding from "straight" photography, but are not the lens and the camera really more mechanical, in the strict sense of the word, than the skilled pencil of a trained artist, used to remove glaring blemishes and to obtain a more beautiful result, by a few dexterous strokes, directed with definite judgment and taste towards a predetermined end?

MAKING HAY. C. M. SEYMOUR.

Figure 6.

PRINT FROM RETOUCHED NEGATIVE.

Figure 7.

RETOUCHED NEGATIVE.

Illustrating article "Retouching and Retouching Appliances," by A. Lockett.

THE CORRELATION OF PICTURES AND MUSIC

By ARTHUR H. FARROW

PROBABLY no branch of photography affords so wide a range of usefulness and pleasure as the making and projection of lantern slides. A print from a negative, however interesting, can be viewed only by one or two persons at a time. Most pictures also have the disadvantage of presenting subjects on so small a scale, compared with the original, that the utmost satisfaction is not derived in viewing them.

By the use of a stereopticon, these disadvantages are to a large degree eliminated and pictures can be exhibited to one or hundreds of people at the same time, and under the best possible conditions. The amateur photographer who has not seen his pictures enlarged upon the screen has missed the keenest enjoyment to be had from his work with the camera.

It is always a source of pleasure and pride to be able to exhibit a collection of good lantern slides, whether it be just to the home folks and a few guests, or to an audience at the club, church or schoolroom. Lectures and talks illustrated by slides are a recognized form of entertainment always in demand.

Unfortunately, every maker of lantern slides has not the gift of oratory, or the nerve required to stand up before an audience and describe the pictures as they appear on the screen. The following plan suggests a way of presenting pictures which calls for very little or no oral effort. Space forbids giving more than a brief outline of the plan, and it will remain for those interested to work out the details according to individual ideas.

In most homes, clubs and schools, there is a Victrola or other make of talking machine, and its services can be enlisted in a novel entertainment scheme. The correlation of pictures and music can be attained by means of lantern slides

THE SIGHTSEER. ARTHUR D. CHAPMAN.

synchronized to the music reproduced on the Victrola, consummating in a combination that will inspire varied emotions. Most people are, we think, sufficiently musical to be able to have some appreciation of sound harmonies and to enter into the spirit of musical tone pictures. The beautiful, whether it be pictures or music, always attracts and inspires lofty thoughts in the minds of man. It has now come to be fully recognized that all art is at unity, that pictures, music, poetry, are but different media for the conveyance of similar or identical lines of thought, and that each medium is translatable in the language of the other.

The idea is not to definitely illustrate certain program music, but rather to visualize its mood by the impressions called forth in the imagination. This form of entertainment is especially adapted for more intimate gatherings, where such an imaginative program would appeal.

The details should be carefully planned. A series of records should be selected and their possibilities in this direction carefully studied. In the music of the masters will be found boundless scope for pictorial expression. Some subjects, of course, lend themselves better than others to such treatment. Vocal music can be successfully used, but violin solos and orchestral selections will perhaps more perfectly harmonize with the scheme.

Select from your collection, or specially make from suitable negatives, lantern slides that will best visualize the music. This will be, naturally, largely a matter of personal taste and ability to appreciate music and pictures. As an illustration of the possibilities, let us take Mendelssohn's beautiful "Spring Song". For this number appropriate pictures would be Spring landscapes, flower studies, pastorals, etc. Studies of Indian life suggest themselves for Dvorák's "Indian Lament"; lake scenes would fit in nicely for Cadman's "From the Land of the Sky Blue Water"; MacDowell's "To a Wild Rose" offers opportunities to present floral studies; while "Le Cygne" calls for aquatic studies featuring the graceful swan. There are subjects almost without end available.

WHERE MEMORY DWELLS. A. B. Hargett.

Just how many pictures will be needed to illustrate each record depends on the length of the record and can be determined by a little experimenting. No attempt should be made to rush through a large number of pictures, rather allow ample opportunity for the audience to study and admire each picture fully. Colored slides usually make the best impression and the greatest appeal, but plain black and white and toned slides can be judiciously interspersed with good results.

An entertainment at home should be of about an hour's duration; for the camera club or church allow a little longer. Much depends on the audience being in a receptive mood and this can be brought about in a number of ways. A plan that works well is to play one or two introductory records without pictures. "Knowest Thou the Land" (Mignon) and Tschaikowsky's "Andante Cantibile" are suggestions. While these are being played the room should be gradually darkened. Sometimes a short travelog or illustrated talk preceding the musical entertainment will answer the same purpose.

To secure the maximum degree of success, a double stereopticon (dissolving view) is recommended. Model BB Balopticon with iris dissolver is an ideal outfit, as it works practically noiselessly, and therefore does not detract the audience's attention from the music and pictures.

A PLEA FOR THE BROMOIL

By WILLIAM ALEXANDER ALCOCK, LL.B.

IT must be evident to the most casual observer that interest in photography is ever on the increase in these United States. Let one, as I have done on many occasions, stand for a few minutes on any Saturday or Sunday at any railroad station or steamboat wharf and watch the passing throng. At least one in every eight persons who enters will be found with a camera in hand. It is true that the fixed focus box with a single lens well stopped down will be largely in the majority but more pretentious outfits will be seen on every side. This indicates that our people are desirous of having a pictorial record of their comings and goings. And as one reads the photographic magazines and annuals and examines the photographic sections of the Saturday and Sunday papers, and studies the literature being disseminated by the photographic supply houses, he is forced to the conclusion that a great many amateur enthusiasts are graduating from the "You push the button—we do the rest" class—and are endeavoring to put something of the artistic into their photography and—while as desirous as ever of having interesting photographic souvenirs of their pleasant excursions—are giving some thought to the composition and arrangement of these records, and wish them to find some more appropriate expression than is usual in the "soot and whitewash" print of the so-called "amateur finisher". And I take it that all—or almost all—of the readers of the ANNUAL have this viewpoint, otherwise I feel certain it would long since have died of poor circulation.

It has been truthfully said that this is the day of the small camera, but with one or two notable exceptions there are few of us who remain satisfied with a small print, especially if we have any ambition in the direction of getting our names in an exhibition catalogue. And as one progresses and masters the mysteries of the enlarging camera we almost invariably

ON A FLORIDA ROADSIDE.
Bromoil Transfer.

WILLIAM A. ALCOCK.

find the desire to vary the monotony of one's prints either by a change in the color through some toning method, or by the use of the coated Japanese tissue, or the more expensive foreign bromides with their wider range of contrast and surfaces—or by making new enlarged negatives and printing in platinum, palladium, kallitype, gum, oil or carbon. It is to those who have reached this stage of their photographic career that these words are addressed.

I am very fond of each of the printing processes to which I have adverted, and with great pleasure I commend them to those fortunate individuals who are able to ride their hobby in the daytime when the sun shines, and who are not—as is the writer—obliged to earn their daily bread during the usual working hours of the average citizen.

For those who are situated as I am, and who wish to make pictures larger than is afforded by a contact print from their small negatives, these words are intended. I would that they were penned by some one whose achievements with the bromoil process are well known, but, as they are not, please consider them as the earnest expression of one who has a keen interest in pictorial photography, one who has taken an extended course of his own medicine, and who feels very strongly on the subject of which he writes.

A rather close study of the photographic literature of the day and of recent exhibitions and exhibition catalogues has forced the writer to the conclusion that with a few notable exceptions American pictorialists are not giving the bromoil process the attention which it deserves. Here is a process which has all the advantages of any other process. It has the permanence of platinum or carbon—as full a range of color as carbon or gum—and as long a scale and as delicate or as broad an effect as the taste and skill of the operator may dictate. It is cheaper than any of the so-called pictorial processes, except gum or kallitype, and it has an advantage possessed by none of them in that one may make as large a print as desired directly from a small negative and the further and to me controlling advantage that the entire work may be done in the evening and that whether the day be wet or dry.

Foreign workers are awake to the advantage of the pro-

FLORENCE S. CHAS. L. SNYDER.

cess. Those who had the good fortune to see the Toronto Exhibition of 1919 and the work there shown of the members of the Liverpool Amateur Club will agree with me on this point, while any one who was privileged to see the exhibition at the Camera Club in New York in May last of the work of Doctor Amasa Day Chaffee will, I am sure, concur in the conclusion that in the hands of the skilled worker no medium, not even hand-coated platinum, is susceptible of producing more beautiful results than bromoil.

The process is simple, cheap and inexpensive. For those who are unfamiliar with the process I will give a short outline of the *modus operandi.* A bromide print is developed in amidol, fixed in plain hypo, washed and dried in the usual way. It is then immersed in a bleaching bath until but a faint light brown image remains. There are many formulae for this bath, some of which will be found in the tables at the end of this volume. I would suggest that a formula containing copper sulphate (blue tone) be used. Any of these bleaching solutions will be compounded by a druggist for a few cents and the bath can be bottled and used over and over until exhausted. The print is rinsed, fixed for a few minutes in a weak hypo bath containing a little sulphite, washed and dried. When one is ready to ink the print it is placed in warm water—about 110°—until the edge is slightly slippery. The print is then put on a damp blotter—surface dried and stippled with a brush charged with a lithographic ink until the picture is obtained. I will not go into further details concerning the technique of the process, as many handbooks and magazine articles have been written on this subject.

It is not a difficult process to master now, although those who first tried it during the war period may challenge this statement. To any such I say, try again. Almost all of the bromide papers now obtainable ink readily.

So the reader who wishes to make a different kind of print—to the one who wishes a pleasant opportunity during the winter evenings to ride his hobby—to the one who wishes to work in a medium which perhaps more than any other permits the exercise of personal control—to such I say try bromoil. It will pay.

BARE BRANCHES. AUGUST KRUG.

AMERICAN METOL

By SIGISMUND BLUMANN

THERE is an annual consumption of approximately ten tons of Metol or its substitutes in these United States, and allowing a profit of one hundred per cent the manufacturers are able at best to glean a hundred thousand dollars, if that much per year. When the equipment, scientific knowledge, difficulty in producing and disposing, and competition is considered this is a very small amount. So small that it is not surprising the Germans with a world market to encourage them had a monopoly.

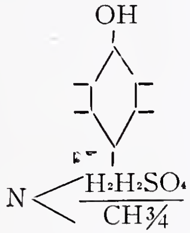
And unless we Americans quickly awake to the facts, and buy our home products, Europe will again be taking our money for finished things made from raw material which we dispose to them for a song. Not so much of a song at that. From the mass of propaganda, lies in most cases, for and against Germany, we may accept the outstanding truth that they did make a Metol that has been equalled in only one instance and surpassed in one other by a French firm and an American individual. I wish names might be frankly written here without the natural suspicion arising that I am advertising some one and something. As a matter of fact I do want to advertise our domestic Metol. I hope to see it win against all comers on its merits first, and because it is American second and last and all the time. We have reached a point when we may stop waving the flag and shouting and get down to real patriotism. What follows is not based on hearsay or snap-judgment, nor shall any amplification or coloring of the truth be permitted to help in serving the purpose. Occasion has done me the kindness of showing that a fairly large reading clientele have absolute confidence in what I tell them from this far point in the west, and I shall jealously guard myself at all times from a sacrifice of this trust by carelessness or design.

The law allows any chemical having the formulae of Mono-

Belle Johnson.

methyl-paramidophenol-sulphate or Methyl-Paramido-Meta-Cresol-Sulphate to be sold as Metol. But Metol may be Metol and not be the Metol we have been getting from Hauff. The molecular arrangement may be varied indefinitely. Serchol, Satrapol, Elon, Monomet, etc., are splendid products, but they are not Metol, if we insist on calling only that real which we so particularized when we could get it, before the war.

The formula reads



The reader's attention is called to the N, normal position. We are told that the Dupont-Nemours Company spent ten thousand dollars experimenting to get just this and gave up. And no evidence has rewarded my efforts to locate any firm or individual in America who has been able to produce, commercially at any rate, what corresponds exactly with Metol-Hauff, excepting a quiet spoken, modest man out here who is making and marketing a better product than we ever got from Germany. When the term better is used it needs qualification. Justice requires that we know that Metol Hauff was as strong, or potent is a better word, as any and was honestly and conscientiously made and sold. Information, then, that shall help in understanding what is meant by better.

Metol is to many a violent poison. It produces a true phenol poisoning, cutaneous and subcutaneously. The claim that the alkalis are to blame is bunk. The same alkalis do not poison when used without Metol. The pernicious element is the free phenol, and when the fresh Metol contains this in appreciable quantities it is a poison from the start, and grows more and more poisonous as deterioration causes a reversion of the constituents to the original phenol base. The freedom from poisoning, and resistance to deterioration will therefore be in proportion to the purity of the product as it is packed. This particular purity has nothing to do with the development potentiality, but is a matter of health and convenience.

Also it is in one way an economy. As the solutions develop phenol from oxidization they discolor, and I am inclined to believe, lose their power to produce the same effects as a fresh solution will. The pure Metol, with the least possible free base will last longer in the dry form, in solution, and be fairly innocuous to the user.

Such a pure Metol is being made in this country. I have had the opportunity of seeing the works and talking to the chemist who makes it. My impressions of the merits were not lessened by reason of his abstinence from extravagant claims or boasting of any sort. I tried repeatedly to inveigle him into a statement that could be used to glorify an American product, but he always countered with the affirmation that his product was nothing but real, purified Metol made, as far as he could learn, in a distinctly original way. No comparisons could be coaxed out of him. But I did succeed in having a little mound of Metol-Hauff (5 years old), and a mound of each year's production, as also one sample fresh from the laboratory all placed side by side on a sheet of paper. The German was a greenish gray, the American (3 years old) faintly tinted, and the fresh white as snow. When the maker reads this he will learn for the first time that I refused his offer of tests and samples because I had a sample in my pocket bought in the open market and that I tested it my own way. Tested it not as the chemist tests, but according to the requirements of the photographer. It stood up under use better, remained as a clear solution longer in the tray, and in the bottle than anything of the sort I have had the luck to use, and did all that the pre-war Metol could do.

The making of Metol will sooner or later become more general. More will make it than the market warrants and will lose money for awhile, drive one another out of business and let the trade revert to Europe. Some will make good and many poor stuff. Personally, I shall always be prejudiced toward the individual who first made it in America by an American method. Otherwise I have no interest in who may ultimately win out. But I would say to my fellow countrymen that they were better citizens if they encouraged native enterprise by patronage. The British, always loyal and consistent in their patriotism, have a habit of specifying British

Made when buying. Importation and foreign competition are healthy for our trade and as a spur to our ingenuity. Foreign competition, too, may act as a chastening influence on the immoderate inclinations of the profiteer, but we who were born here, who depend for our prosperity on the general prosperity, who erstwhile hung flags over our doorways and pinned buttons all over our coats, we who listened enrapt to four-minute speakers and perchance were permitted to exploit our patriotism as four-minute speakers, we, once more, who went across or served at home, or should have served and didn't, may now quiet down, get on all fours and pull to a common purpose. Having been public patriots we can afford to silently become real Americans. Let's buy the goods made by one of us. Especially let us do that when those goods are just as cheap, just as good, or better.

MOUNT WILSON. J. A. SINGLER.

IN THE LAND OF MYTHS WITH THE CAMERA

By GEORGE D. JOPSON

The nurse's legends are for truth received
And the man dreams what the boy believed.
—DRYDEN.

WE mortals are more or less dreamers—if we were not where would our composers of music, artists, inventors, promotors of gigantic industries and a thousand and one other useful things that are the results of visionary minds have sprung from? Then where would our photographic pictorialists be if it were not for idealizing some childhood legend that still haunts the deep recesses of memory?

When the pictorialist enters into "The Land of Myths With the Camera" he expects to find his mythical subjects quite unconventional as to matter of attire or lack of it. The fairy, elf, sprite, naiad, or whatever title one may desire to give to his re-incarnated (from childhood) dream subject, must appear different from the conventional every day person one meets and associates with—

"Like a fairy, trips upon the green,
Or, like a nymph, with long disheveled hair,
Dance on the sands, and yet no footing seen!"

We have pictorialists who dream of babbling brooks, smiling fields in bloom with varied colors of the wild flora, lordly rivers or water-falls, high crested waves and majestic mountain heights—yet there are those sincere workers whose ambition is to bring to their visual mind the nurse's legend which, as a boy—a child, they "for truth received." They are actuated by a commendable inspiration—a desire to put life—breath into the visionary fairy of childhood legend. Therefore they take with them into the land of myths their camera for the purpose of reproducing nature as they have dreamed it.

THE CAVE SPRITE. Figure 1.

Illustrating article "In The Land Of Myths With The Camera," by George D. Jopson.

With their camera they follow the play of the body in motion, the quick strong step of the foot upon turf or sand "and yet no footing seen," the firmness of the limbs. the sway of the rounded torso, the poise of the neck and head—yet it is all reproduced in an airy-fairy visionary atmosphere. To produce this class of mythical nature figure studies the conscientious worker realizes that more interest, backed by indefatigable perseverance, is required than is usually called for in the making of the usual conventional photographs.

Then after careful planning and transforming the vision into an artistic creation and reality—for with such we are dealing—the ignorant prudes and unappreciative generally, will tear the vitals out of our commendable efforts by labeling them after the pattern of their own misguided and oft-times indecent minds. But it was ever thus: The unmusical can not see anything in music, nor can the unartistic mind—plus ignorance, prejudice and low ideals—see anything in artistic or beautiful creations, especially those clustering about the human figure. "Unto the pure all things are pure; but unto them that are defiled and unbelieving is nothing pure; but even their mind and conscience is defiled." This is true to-day as when Paul wrote it to Titus many years ago. (Figure 1).

I present my study "The Cave Sprite" for two reasons: First, during one of my rambles in the Catskill Mountains I discovered this little cave hid amongst the rocks and boulders that were possibly placed there by some legendary giant of prehistoric ages, and now forming a wall for a beautiful wooded dell. It gradually associated itself with some childhood legend with the result that I desired to see it reproduced as the haunt of sprites—just an inspiration, a re-incarnation of a child's vision. Second, the only criticism given this study is that the sprite should be seated on a sheep skin. Would not the sentiment of fairyland be ruined if we associated the sprites of that mythical world with butchering sheep? Let us associate our fairy creations with flowers, music and the dance. Witness the inspiring interpretations as given to us by Miss Kate Smith, for her sentiments run to such ideals. "Gentle Spirit of the Stream" (Figure 2),

GENTLE SPIRIT OF THE STREAM. Figure 2. KATE SMITH.

Illustrating article "In The Land Of Myths With The Camera," by George D. Jopson.

is seated on a shelving rock—no sheepskin to mar the sentiment, or draw the mind from the perfect composition of this fairylike study. Then her "Fairy Lamps"—light gauzy drapery and everything suggestive of mythical mystery. (Figure 3).

Therefore, if we take our camera into the land of myths, let us do so in the spirit of mythology—with a sincere, artistic and pure purpose, leaving conventionalities behind—going with one ideal, and that ideal a poetic inspiration—an inspiration that will cause our hearts to sing, upon the completion of our fairy dreams with Longfellow:

Ye are better than all the ballads
That ever were sung or said,
For ye are living poems
And all the rest are dead.

YOUNG WOODCOCK. DR. J. B. PARDOE.

FAIRY LAMPS. Figure 3. KATE SMITH.

Illustrating article "In The Land Of Myths With The Camera," by George D. Jopson.

A. W. H. WESTON.

THE BEDROOM AS A DARKROOM

By HENRY F. RAESS

THE bathroom as a darkroom has its limitations. And so the writer decided to turn a spare bedroom on the top floor into a darkroom. The room measures 12 feet long, 7 feet wide and 9 feet high, omitting inches. An elaborate explanation will not be necessary as the two accompanying photographs (Figures 1 and 2) will explain the arrangements of the room. But for the sake of clearness these will be supplemented by a brief description.

A window looking into the yard was darkened by means of two opaque shades. Only one is seen in the illustration, the other one had not been hung in place when the photograph was taken. But it hangs outside of the strips of board seen in the picture. This way of covering the window does not prevent its proper use of admitting light and air when required. For obtaining water a stone wash tub was in-

BETRAYED BY THE MOON. THOMAS CARLYLE.

stalled, but some might prefer a deep iron sink. The water supply and waste were easily attached by a plumber, as there was a kitchen in the room below. The shelving, developing bench, closets and lamp-house were made of old boards which were still in good condition. The arc lamp for making the enlargements is mounted so it can be moved in three dimensions and thereby keep the arc in focus of the condensers. This way of mounting the arc lamp obviates the necessity of having to constantly use a ground-glass diffuser except when stopping down very much.

Figure 2.

This is a great time saver with slow papers as the full intensity of the arc can be used. As a matter of fact it was found that when once the arc was centered it very rarely required any other adjustment but that of moving the lamp towards and from the condensers, according to the position of the enlarging easel. The latter is an artist's stand permitting the use of printing frames which can be raised or lowered. It is hinged at the bottom allowing it to swing backwards or forwards for correcting distortion in case the camera was not held level. The easel is provided with grooved wheels running on tracks.

JANE. G. W. HARTING.

A word about the ruby lamps. A double one open may be seen at the right hand in Figure 1. They are a modification of a French design of some fifty years ago. Their triangular shape has proven most practical after fifteen years of constant use in the dark-rooms in the late New York Herald. The illumination is furnished by two candle power lamps. For developing plates an 8/10 Wratten & Wainwright Safelight (made by Eastman Kodak Co.) is used; for paper two thicknesses of Orange "post office paper" placed between two sheets of glass. Another lamp like that for the paper is placed over the fixing tray and box. Figure 2 is a three plate "panoram." In the lower left hand may be seen the printing machine described in last year's ANNUAL (page 232).

Figure 1.

Illustrating article "The Bedroom As A Darkroom," by Henry F. Raess.

THE OAKS IN WINTER.

WM. F. KRIEBEL.

IF I WERE A BEGINNER

By C. H. CLAUDY

IF a fellow could only be twenty-one again, with the knowledge and experience he has at forty, wouldn't he have a hum-dinger of a time?

And if a fellow who has made many thousand good and bad pictures for twenty odd years could start off all over again, wouldn't he save himself a lot of worry, time, money and mistakes?

If I were a beginner in photography I'd begin at the logical place . . . . . . which is the beginning . . . . instead of somewhere in the middle, which is what a lot of chaps do who have more money than brains. I'd buy me the simplest little kodak as is, and some rolls of film, and a developing tank, and I'd take my little book and sit down and learn it from A to Z before I did a single "do" towards making a picture.

I'd get me the simplest kodak, rather than a more elaborate model because (1) you don't have to focus the little chaps (2) they don't cost much to run (3) you can learn just as much with them as you can with a five hundred dollar outfit, until you reach the limit of their capacity (4) they bring no problems of depth or distortion and (5) you don't feel wicked when you discard them for a better outfit.

If I were a beginner I'd begin taking pictures on *one* kind of subject, and I'd take nothing but that one kind of subject until my little developing tank showed me a whole string of perfect negatives. If I were a beginner I'd have someone give me a perfect negative of a similar subject so I'd know when mine were perfect. I'd begin with street scenes, or the garden, or a fence post, or the barn and for a week I'd just make pictures of said street scene, garden, fence post or barn, from far and near, high and low, in bright light and dim, morning and afternoon, rain and shine. And I'd have a little note-book, and I'd put down all the conditions of each picture as I made it, and when I had them done I'd put the negatives in the book opposite the date.

ON THE FRINGE OF THE DESERT. Louis J. Steele.

All this would I do if I were a beginner with to-day's experience, because I would know then what I know now, that while kodak and film, developing tank and velox paper are as near fool proof as the ingenuity of man can make them, they are not so automatic as to take all the joy out of photography.

If I were a beginner I'd use a tank, rather than hand development for three reasons. First, in the long run, it gives better results. Second, it's easier; and third, I'd have so much to learn, anyway, if I were a beginner, that the less I had to bother with any *one* operation of making pictures, the less apt I'd be to get confused in the learning of the rest of them.

I'd take mightly good care, too, that I ran the tank according to the instructions made and provided by the manufacturers of said tank. If I were a beginner I'd remember what most beginners forget, which is that the makers of tanks and films and kodaks are anxious for you to succeed because the more you succeed the more enthusiastic you get, and the more enthusiasm you have the more pictures you make and so the more material and instruments you buy. And so I'd know that when they say to develop so many minutes at such and such a temperature with a solution of such and such strength they don't mean twice as many minutes, ten degrees hotter, or with a weaker or stronger solution. And so if I were a beginner properly using my tank, and got punk negatives I'd know it was me and not the development which was at fault.

If I were a beginner I'd forget all the artistic pictures I'd ever seen, and concentrate on learning the right exposure for different conditions. I'd know, then, what I know now, that the biggest of the foundation stones to good photography is correct exposure of the film, making a negative. If you have the right exposure and use a developing tank with regard to the instructions you just can't help getting good negatives. And if you have a good negative you can't help get a good print if you use common sense with your velox.

If I were a beginner I wouldn't try every paper that the market affords. I'd just get one package of one kind of paper and I'd use that up and then I'd go buy another package of the same kind and I'd use *that* up and so on and so on until I know that particular surface and grade of velox well enough to make it behave when I used it. I'd have a sign pasted up in my workroom, if I were a beginner "success in velox comes from clean hands, good chemicals and following instructions" and I'd know then, what the years have taught me now, that when you make a misprint the chances are almost a hundred thousand to one that the fault is with you and not with the paper.

If I were a beginner I'd learn something about the optics and the chemistry of photography against the time when I'd want a better instrument and a better lens. I'd learn *why* my little pocket kodak didn't need be focussed and why the larger sizes have lenses which must be focussed. I'd learn not only when to use the "stops" in the lens, but *why* I used them, and what the relation was between them and the time of the exposure I gave.

In few words and short, if I were a beginner I'd try to begin, not to plunge in and try to swim right off the reel . . . roll I mean. I'd know if I were a beginner with twenty-one year's experience, that he goes fastest in photography in a year, who goes slowest in the first few weeks, and I'd realize that economy of material, developers and apparatus is best served by real knowledge, said real knowledge only being obtained by *personal* experience, *personal* study and *personal* effort.

But of course, I am *not* a beginner and so I have several large and expensive cameras and do strange and unnecessary things when I develop and print, and I can still produce the most atrocious pictures when I forget the rules and regulations made and provided, and I have more fun doing it than any beginner has, just playing the game safely and sanely. Which is no argument for the beginner to go and do likewise . . . . rather is an argument as to the feebleness of the effect of experience upon the kind of mind which loves to try experiments.

Nevertheless, if I were a beginner now, with my present experience, I'd do as I say I ought to do, and not as I did, and still do.

MRS. ETHEL STANDIFORD-MEHLING.

A FEW NEW METHODS

By MARCUS G. LOVELACE, A.B., Mus. Bac.

THE task of trying to write anything new in photography is beyond the power of most of us, and all that can be done in general is to try to get something that the other fellow does not know as well as the writer. The past few years have been hard ones for the whole trade, both amateur and professional, as the materials have been of inferior quality, and hard to get at that. The majority of manufacturers seemed to think that "get while the getting's good" was the motto to be adopted, and the stuff that was sold should have put some of them into a position of being guests of the state for a few years.

The Kodak Company told of a sale of Metol that was largely sugar mixed with hydrochinone—real Metol would be cheaper than sugar at present—and various other frauds were perpetrated on the poor photographer who was trying to accustom himself to do without Metol.

Fortunately, in the course of time real Metol was available although the means of obtaining it were difficult in the extreme. It was found that the specifications given in the German patents left out a great deal that was absolutely vital to the manufacture of the chemical and in various ways led the searcher astray. From the general context of the patents, and the nature of the chemical, it was supposed that Metol could be made by the direct methylation of para-amido-phenol, and many searchers wasted time and money in trying to do so, without much success.

The story of the search for the true method of making Metol is a long one. The various German patent specifications are very misleading as far as can be seen from the experimental work done in this country, and while it is possible that Metol was made as per formula by them, the chances are that it was not. For instance, in the Hauff patent, Metol is described as "Methyl para-amido-meta-cresol." Later inves-

THE PICTURE BOOK. A. J. WEIS.

tigators seem to be inclined to think that it was not a derivative of cresol, but a sulphate salt of methyl-para-amido-phenol.

Paull attempted to make Metol by heating under pressure para-amido-phenol with methyl alcohol, and also with methyl chloride, but was unsuccessful. In fact the direct methylation of para-amido-phenol has never been a success, the chemical being made by other methods and by a more indirect way.

The Gesellschaft fur Anilin Fabrikation secured a patent in 1908 for the manufacture of para-amido-phenol and the N-alkylated p-amidophenols by heating under pressure, para-chloro-phenol with ammonia or alkyl-amines using copper sulphate as a catalyst. Merck took out a similar patent in 1913 using hydroquinone and a mono-alkylamine, and heating under pressure for several hours.

It is possible to produce methylamine at a moderate cost by the methylation of ammonium chloride with formaldehyde, giving a good yield at low cost, and the discovery of this fact rendered the manufacture of Metol possible at reasonable prices.

Hydroquinone and an aqueous solution of methylamine are heated together under pressure for some considerable time. At the close of the heating the contents of the containers are run into 1:20 sulphuric acid in amount just equal to amount of methylamine used. The mixture is boiled, extracted with ether, to remove the remaining hydroquinone, and the remaining aqueous solution is boiled to reduce its bulk, cooled in ice, and the crystals thrown down washed with alcohol on a Buchner funnel, and afterwards re-crystallized from boiling water containing a slight amount of de-colorizing charcoal to each litre.

Analysis, and melting tests, both simple and in mixture, confirm the results that the mystery about the manufacture of Metol is really not a very complicated affair after all.

The method given above is not stated to be the one that is used by the Eastman Company, or by any particular company, but with slight modifications is the one that is used wherever Metol is made at the present time. Different makers will find different ways to reach the same chemical result, but the above method is the basis of all the procedures used in this country—and it seems probable that German Metol was made in approximately the same way. At any rate the Metol question is

THE SMOKY DAWN. FRANCIS ORVILLE LIBBY.

solved, and whether we get any more German chemicals or not the photographer can rest assured that first rate Metol is available either as the Eastman Metol, or as Monomet.

One of the developers which came out as a result of the stoppage of Metol was "Monomet." This is claimed to be true Metol, and to all practical purposes it is. It can be used in the same way and substituted for Metol gram for gram with equally good results. From its behavior toward other chemicals I do not think it is identical with Metol, but as far as its photographic uses go it is of exactly the same nature, and can be used instead of Metol.

The Eastman Metol, which is quite new, is true Metol in every way, and is a credit to the fine list of chemicals made by them. I have used it a great deal and have found it identical with German Metol.

I have a few new wrinkles this year—that is they are not new, but I do not think many of the readers of the *Annual* use them and I can vouch for them, for I have an unpleasant habit of trying most of the formulae that are new to me, and I frequently echo the old saw "Wonderful if true." The first one is a method of making snappy bromide prints from flat negatives. Don't use it if you can get contrast bromide, as the following process takes longer, but if you are caught unawares and have to make an enlargement from a flat negative, this will work. Make your enlargement very dark—over-exposed and then develop fully, fix, wash and you are ready. It will be a very black looking print, but never mind. Prepare the following solution:

Potassium Iodide	7 grams	108 grs
Iodine	0.7 grams	1 3/4 "
Water	1000 cc	35 oz

Iodine must be crystals, not the tincture. Solution is poisonous, so mark it so. Immerse the print in this until the white parts are a deep blue. Rinse and then fix for about five minutes—if it is not bright enough, wash, immerse in the above solution again and then fix.

Sometimes we have a line drawing which has been copied, and which is too flat from lack of contrast in the drawing or poor manipulation of lighting or developing. If you cannot make a new plate try this reducer. It's old, but it's still the

THE FOUNTAIN OF YOUTH. G. W. Harting.

best for the flat, sick looking plate without any strength of character or moral principle. If the plate has been fixed in an old ripe hypo bath, then throw the negative away as it's not likely to work well when intensified, but if the plate has been well fixed and then well washed, bleach it in

Mercuric Chloride............25 grams. (Poison) 385 4/5 grs.
Hydrochloric Acid............5 cc 1 Dr. 25 min
Water ....1000 cc 35 oz

Bleach it clear through to the back, thoroughly wash about five minutes and blacken in

Silver Nitrate ....23 grams 355 grs
Potassium Cyanide..............23 grams (about) 355 grs.
Water (distilled)...............1000 cc 35 oz.

Dissolve the silver nitrate in about ½ the water, and the cyanide in about ¼ of the water. Add the cyanide solution a little at a time to the silver solution, with constant agitation, until the heavy precipitate is just dissolved and the solution is clear. Should it not entirely clear up when all the cyanide is added, drop in a few tiny crystals of dry cyanide at a time until it just clears up. Then add the balance of the water to make 1000 cc.

On immersing the bleached negative in this solution it will immediately begin to blacken and must be watched carefully. Intensification proceeds rapidly up to a certain point and then reduction starts in the shadows. When this has gone far enough wash the plate well and the process is complete. The plate can be washed, bleached and the process gone over again if more density is required, and if extreme contrast is needed it may be reduced with hypo and potassium ferricyanide and then intensified. It is easy to get a negative of clear glass and jet black high lights without any trouble and the results are permanent.

I have told how to get a hard print from a soft negative, so it may be in order to tell how to reverse the process and get a soft print from a hard negative. Make the print or enlargement as usual giving considerably more exposure than is needed, then before development immerse in the following bath:—

Potassium Bichromate ....10 grams 154 2/5 grs.
Hydrochloric Acid......................3 cc 46 1/2 grs.
Water to ....1000 cc 35 oz.

The length of time the print is immersed determines the amount of image removed which must be found by trial-starting with say, 10 seconds. The print is well washed and then developed. If the image is too weak it was too long in the bichromate bath, or was not printed enough. If it is too black and dark give it more time in the bichromate bath.

Sepia toning is a thing that is notoriously uncertain, but some facts have been isolated with regard to it which may be of value to the man who tries to make them. From the same negative three prints were made—A, B and C. A had proper exposure, so that it developed fully and stopped; B had twice the exposure and was halted in development; C was under-exposed and developed a very long time. A then had a long range of tones from high light to shadow; B had a flat look—muddy and dark, and C was too contrasty. A cross section of the prints under the microscope showed that A had uniform particles of silver of medium size right through the emulsion; B had very fine particles all near the surface of the film, and C had very coarse particles which were evenly distributed through the film.

On being toned in sulphide baths these prints gave the following results: A was a warm sepia, B a familiar yellow brown, and C a cold sepia. The results all through confirmed the first conclusions that the longer the development the colder the tone—other things being equal. There are two reasons for the yellow tone from over-exposure and short development. The fine grained deposit of silver is yellower in color when turned to silver sulphide, and secondly it is so fine and transparent that much of the light passes through it, and is reflected back from the white paper base. The deposits in the case of the other two prints are more dense, and do not allow so much reflection, so that their tones are colder.

As a result it will be seen that trying to get a decent print from a hard negative by long exposure and short development may give you a very good black and white print, but if toned sepia it will give the result as did print B—a yellow brown tone.

On the other hand, by forcing development on an under-exposed print you will get a cold sepia in the resulting print. In order to get a regularity of tone, the prints must be made with proper exposure and then developed for one, two, three

TIRED OUT.

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and four minutes so that at the end of these times you get a fully developed print. These may be toned and kept as standards. In making a print we then determine which of these tones we desire to obtain, and then adjust our exposure to fit it. Make three test exposures, develop for the time selected, and thereby determine the proper exposure that will give a fully developed print in the development time selected. For instance, if the tone that is selected requires two minutes development and we make test prints giving five, ten and twenty seconds and find that the ten second one will just finish development in two minutes, then we can go ahead and make prints with a ten second exposure and two minutes for development, being sure that we will get what we want. The developer must be kept cool and fresh and the hypo bath must be clean and not too old.

Remember that every print you develop in a tray of solution increases the amount of bromide in the developer, and consequently changes the action of your developer with every print. Don't over-work your developer. Better use small batches and change it oftener.

If one is working large batches of prints it is sometimes worth while to use the liver of sulphur process—potassium sulphide. It has many advantages for speed work, although the tones are hardly as good as the other methods. The chemical itself is very cheap—potassium sulphide—and all that is necessary is to make a five to ten per cent solution. It is not necessary to wash very much after fixing—say five minutes—but if alum is used in the fixing bath, prints must be washed well. It is a good plan to use plain hypo bath for these prints and then give them three minutes in formalin. Rinse them off after the formalin and place them at once in the toner. It should be about 100 Fahr.—not too hot, but just warm—and the toning is instantaneous. A slight addition of Schlippe's salt (sodium sulph-antimoniate) say two per cent—gives a very nice tone but slows up the bath. The strength of the potassium sulphide bath is not essential.

There is another method which is an old timer but is little known. After leaving the wash water the prints are given a three minute bath in formalin, or the following:—

A MOVIE GIRL. F. WILLIAM CARTER.

Alum ....25 grams
Chrome Alum ....15 grams
Water ....500 cc

Wash about ten minutes after this bath as alum is fatal to good results. Then immerse in the following bath:—

Potassium Sulphide ....4 grams
Water ....568 cc
Ammonia a few drops.

Heat to about 110 Fahr. and toning will be almost instantaneous. The only care to be taken is to wash well if alum be used, as its presence is very deleterious.

From sepia prints to drying negatives is a long jump, but it is made now and over with, so why worry. Many times it is necessary to get a print from a wet negative, to save time. There are several ways to do it.

Give it an alcohol bath and then dry it. This is all right if you can get the grain alcohol to do it with.

Dry it in front of a fan. All right, if you don't get dust on it.

Bathe it in formalin and dry with heat. This is good if you don't mind a little extra contrast in the negative.

Use the potassium carbonate method. This also is good.

Bring the plate and a piece of paper together under water and then squeegee them together.

Bring a piece of very thin celluloid into contact with the negative under water and then squeegee together. Dry off the celluloid with a soft cloth and you are ready to print.

Put your wet negative in a lantern and make a print on bromide the same size as the original negative. This is an excellent method.

As far as the time required to get the negative ready to print I will give them in order, beginning with the alcohol bath.

Alcohol and fan—10 to 15 minutes—perfectly safe.

Formalin and heat—5 to 10 minutes—same.

Potassium Carbonate—8 to 10 minutes—same.

Wet print and squeegee. It has been known to work without ruining the negative—but very seldom. 5 minutes.

Wet plate and celluloid. Sometimes this works, usually not. 5 minutes.

Lantern and bromide paper—5 minutes—it always works

DR. J. B. PARDOE.

unless the negative is so dense as to require an exposure that subjects it to undue heat from condensers—up to a minute or so it is safe. Dry the glass side with a soft cloth and go ahead. Use a test plate to get the focus and size right. With the lantern and a little care, you can make prints without washing the negative—just rinse off the hypo, dry the back with a cloth, whirl it if you have a whirler and go ahead, washing the plate afterward.

Personally I prefer the lantern method, or the use of a solution of potassium carbonate. This has been given in the pages of the *Annual* before, but it is sufficiently good so that I feel that it is not amiss at this point. Take a bottle of potassium carbonate, C. P., say a pound bottle, and add as much water as it will take up. In a short time—say half an hour—you will find that the fluid in the bottle has diminished considerably—keep adding water until the bottle remains at a constant level and there is a little solid carbonate at the bottom. The solution *must* be saturated. It is used as follows. After washing the negative, let as much water drain off as possible, and then immerse in the carbonate solution. Leave it in the solution about 5 minutes and then remove, drain, and *wipe* dry with clean cheese cloth. The directions are all that is needed, as this strange method works to a charm. The negative will have a greasy appearance—keep on wiping with small clean pieces of cloth until this disappears. It does not harm the negative and they appear to be as permanent as any others.

Often one has unfixed prints-proofs to copy. Sometimes a print is sent in which has almost disappeared due to the action of light fogging it—Of course I am referring now to the proofs on P. O. P. which most photographers still use. They can still be copied if done properly. The fog must be removed as sometimes it has entirely obliterated the image, but the following reducer will remove most of it without trouble:

Solution A	6 cc
Solution B	1 cc
Water	500 cc

Solution A is 9.7 grams potassium iodide, in 10 cc water—add 3 grams iodine in flakes and make up to 28 cc.

Solution B is 5 grams potassium cyanide dissolved in 50 cc water.

THE PLUM TREE. Edward Weston.

This reducer will take a little time to act, but must be watched closely, and as soon as the image clears up and the fog disappears the print must be washed very thoroughly. If the image is strong enough it may then be toned and fixed. If after toning and fixing as usual the print is too weak, it may be intensified with the ordinary mercuric chloride intensifier, followed by the usual toning and second fixing.

If the print is very weak after reducing it may be developed instead of being intensified, using the following developer:

Pyro	4.6 grams
Tartaric Acid	4.6 grams
Water	1000 cc
B.—Potassium Bichromate	.009 gram
Water	1000 cc

Use equal parts of the solution. "A" solution does not keep.

Fix in hypo 160 grams, lead acetate 23 grams, water 1000 cc. This will give a strong print if there was any image there in the first place.

One more formula and one only. Many times there is a call for an image on canvas for painting in oils. That is a photographic base in the form of a weak image to be painted over in colors—and the following process will be found to be all that is necessary. Stretch the canvas on a frame and coat with

Calcium Chloride	4 grams
Methyl Alcohol	142 cc

Rub well into canvas using pad of cheese cloth and allow to dry. It will need quite a little rubbing to make the canvas absorb the solution freely but continued rubbing will make it do so. When quite dry it is coated in orange light with

Silver Nitrate	21 grams
Water	85 cc

This solution is rubbed on evenly with a pad of cheese cloth and then allowed to dry. The cloth is then ready to print. It should be printed in the sun, or by an arc lamp. The time will run from five to fifteen minutes depending on the light. When exposure is complete—which should be determined by a test strip—the picture is washed for two to three minutes in running water, and then drained and immersed in

Water	500 cc
Ammonia	100 cc

for about five minutes and then washed and stretched on frame again when it will dry perfectly tight and firm, and be ready for painting.

A paper for the *Annual* from me would not be complete without a reference to color plates, and I am able to give here with much pleasure the new development methods of Messrs. Lumiere for the benefit of those who have not had a great deal ot experience with autochromes. I do not think this method has ever been given in this country, and I am able to assure you that it is a great improvement on the old systems. The developer used is the standard metoquinone developer as given in the methods of Messrs. Lumiere, but in case this is not obtainable the following formula is exactly the same.

Metoquinone	15 grams
Sodium Sulphite—anhydrous	100 grams
Potassium Bromide	6 grams
Ammonia—(Sp. Gr. .923 or 22 degrees Baume)	32 cc
Water	1000 cc

Make two trays of developer—

No. 1	Stock Solution	10 cc
	Water	15 cc
No. 2	Water	30 cc
	Solution No. 1	2 cc

Put the plate in Solution No. 2 and watch carefully foı the first trace of image, ignoring the sky line, if there be one. Note the number of seconds that elapse from the time of immersion until the first appearance of an image, and then immediately place the plate without rinsing, into Solution No. 1 and develop for the same length of time as was required to give the first trace of image. Temperature should be about 60 Fahr. and, of course, the special safe-light for autochrome plates must be used—the Wratten Safe-Light Series No. 3 as sold by Eastmans is excellent for use with autochromes.

S. H. WILLARD.

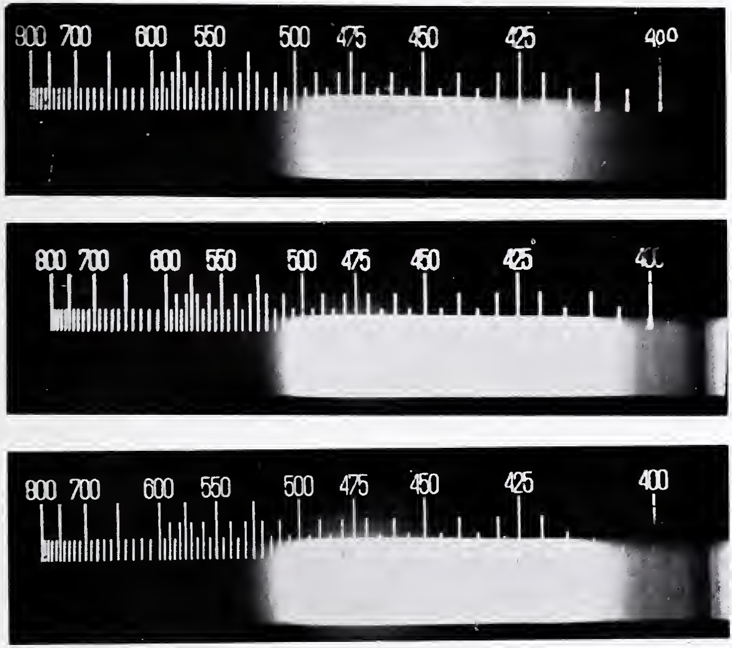
ORTHOCHROMATIC PLATES AND FILTERS

By ARTHUR G. ELDRIDGE

THIS is a well-worn subject, yet there are many who do not use orthochromatic plates and many who do, without improving the quality of their work. It is a notable fact that portrait photographers do not use them, as evidenced by the great amount of retouching, the dark lips and blank tones in the hair. Obviously the failures are not due to faults of the ortho plate, but to improper treatment.

There are several reasons why some photographers prefer the plain emulsion, it may not be because they discount the qualities of a color sensitive plate but rather because they have never begun to use them. I know a man who uses contrast plates for everything he does; botanical work of all kinds out-of-doors and in. These plates have great latitude; their keeping qualities are beyond all others; they endure a strong ruby light; these are the reasons. Estimate the exposure, multiply it by four or five to allow for poor judgment and you are sure to get something on the plate. What can you expect to get on close-to subjects that are green, or yellowish and reddish brown, for such plates are quite blind to these colors and prolonged exposure does not cure it.

To understand the sensitiveness of a plate we must go to the spectroscope. This may look too difficult or complicated, but we will learn more in a short time than by several years of unsystematic observation. The spectrum gives us three regions of saturated color and their mixtures, also a narrow region of yellow. To use the spectrum is a severe test for any plate, more severe than anything that will come in out-of-door work. We must remember that colors out of doors are overlaid with blue reflected from the sky; that all objects reflect their color onto each other and that the surface of most objects is sufficiently rough to scatter much white light and other colors. For these reasons we rarely have anything that approaches pure color in landscapes, so it is possible to get good results without using a panchromatic plate. The Autochrom is a remarkable example of well-balanced sensitiveness, and reproduces the colors of the landscape and of high-colored objects near to it in a very superior way. The plate is sensitive to the full spectrum and yet it cannot reproduce the red region with even approximate truthfulness; this bears out some of the above reasons. Fail-



No 11

No 60

No. 52

Figure 1.

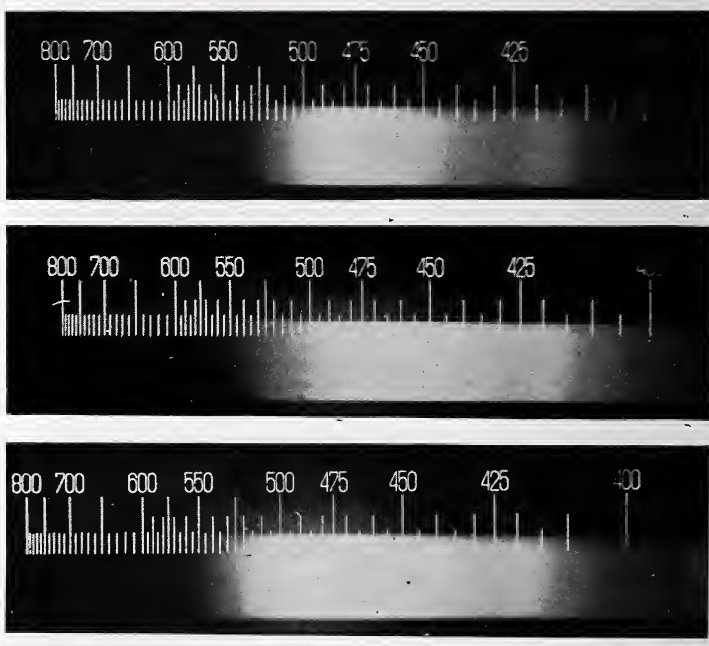
No. 11. Contrast Plate. 12 sec. exp. No. 60. Contrast Plate. 30 sec. exp. No. 52. Contrast Plate. 120 sec. exp.

ure to recognize these facts leads to a misunderstanding of the relative merits of orthochromatic vs. non-ortho plates.

One may often be told that the fast grade of ortho plates gives practically no better results than a plain plate of the same speed. This is not true, and it makes no allowance for the possibilities of the ortho plate with a light color screen.

Let us apply the spectrum to a plain contrast plate. With normal exposure the sensitiveness stops at the green, recording only violet and blue. We do not increase the record below the blue appreciably by prolonged exposure. (See Figure 1).

Since this kind of plate is not sensitive to yellow we would not expect to use a screen, and yet a yellow filter known as visual luminosity does increase the record in the green and of course reduces the violet. This is because the filter is a greenish yellow; the green element extending the record



No. 71

No. 64

No. 48

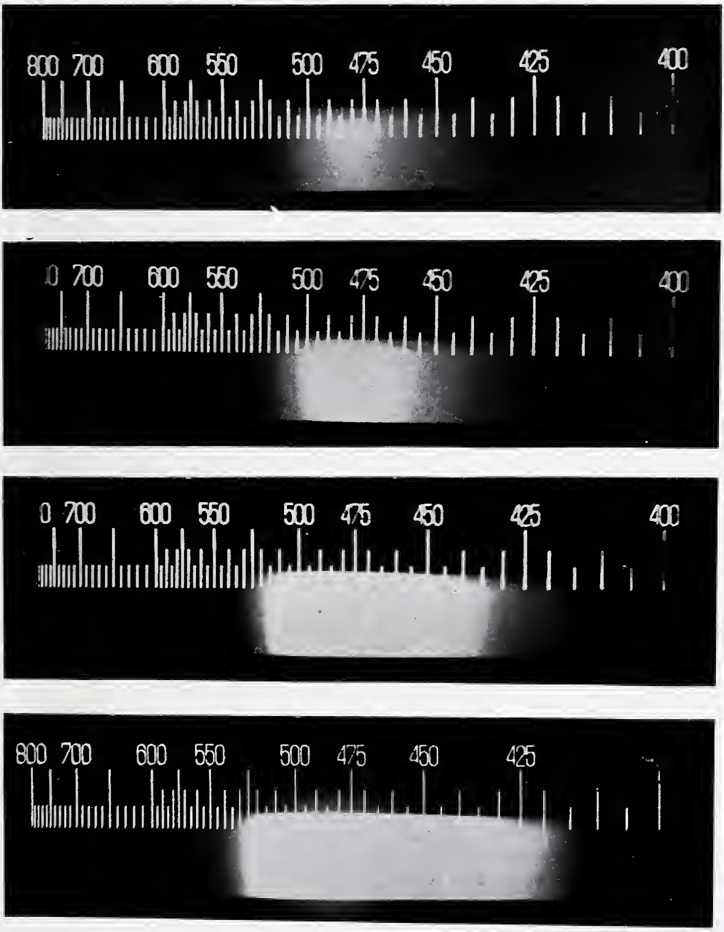
Figure 3.

No. 71. 1 sec. exp. No. 64. 5 sec. exp.
No. 48. 5 sec. exp. Much used developer.

on the plate while the yellow stops part of the violet. See Figure 2).

Take a fast plate of the type Cramer Hi Speed-Seed Graflex-Record 500-Sigma. We find that the sensitiveness to the green region is considerable and that it is extended by increased exposure. (See Figure 3).

In No. 48 the increased record in the violet beyond 400 a.u. is very marked. Four hundred and seven is the last visible



No 72

No. 66

No. 67

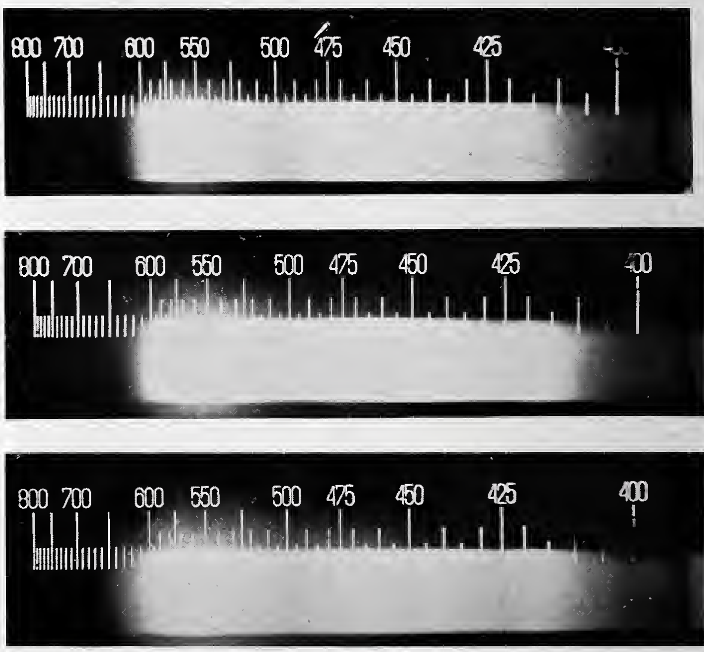
No. 61

Figure 2.

No. 72. Contrast Plate. V. L. Filter. 10 sec. exp.
No. 66. Contrast Plate. V. L. Filter. 20 sec. exp.
No. 67. Contrast Plate. V. L. Filter. 40 sec. exp.
No. 61. Contrast Plate. V. L. Filter. 4 min. exp.

line on a Hilger quartz Spectrograph and lenses pass the ultra violet up to 365 a.u. It is, therefore, evident that a normal exposure will give a stronger negative than under exposure not alone because of the cumulative effect of increased duration, but also because the ultra violet is recorded. As with the process plate we find that a greenish yellow filter extends the record farther into the green.

Take a fast ortho plate of the type Standard Orthonon,



No. 62

No. 49a

No. 53

Figure 4.

No. 62. 5 sec. exp. No. 49a. 12 sec. exp. No. 53. 120 sec. exp.

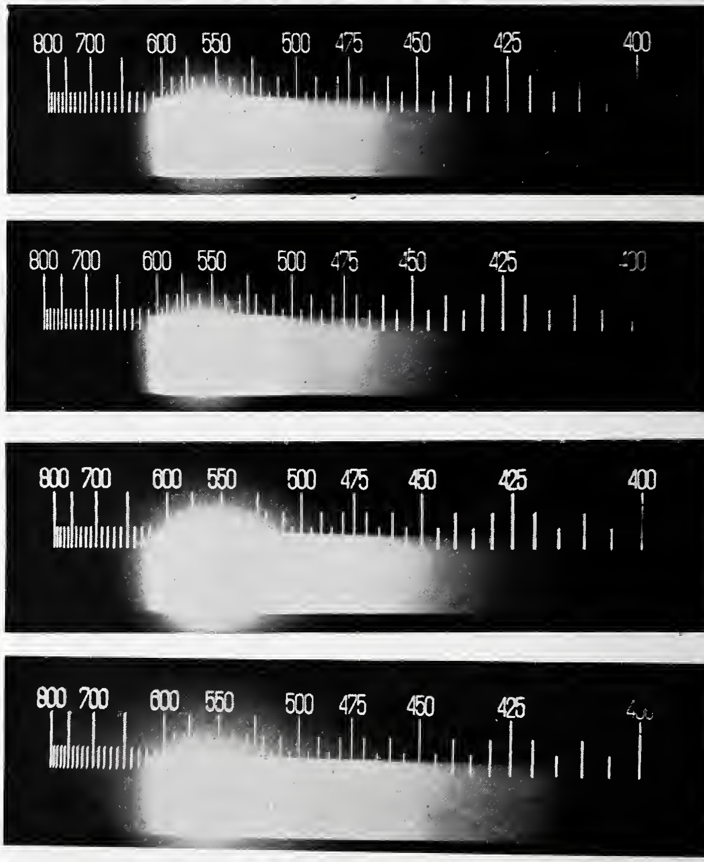
Portrait Isonon, Seed L Ortho, Hammer. (See Figure 4).

We see that the record is extended very little below the yellow. Even by the use of the visual luminosity filter the record is not extended into the reds. (See Figure 5).

For a plate which is sensitive to the entire spectrum we must take one of the type Wratten and Wainwright Panchromatic or Cramer's Spectrum. (See Figure 6).

With a visual luminosity filter most of the violet and blue is shut out while the red is extended a little. With an

PASSING CLOUDS AND SHADOWS. LAWRENCE BAKER.



No. 73

No. 69

No. 68

No. 63

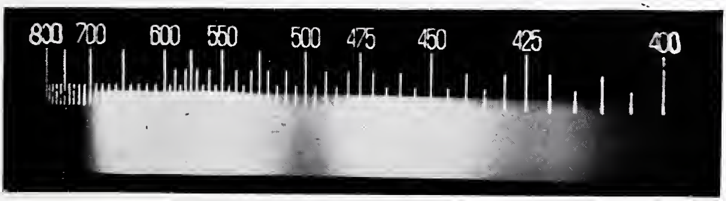
Figure 5.

No. 73. V. L. Filter. 3 sec. exp. No. 68. V. L. Filter. 20 sec. exp.
No. 69. V. L. Filter. 10 sec. exp. No. 63. V. L. Filter. 40 sec. exp.

orange red tricolor filter the red is extended to the infra red. (See Figure 7).

There are several very noticeable facts in these spectrographs. First: that the ortho plates show a marked failure in the blue-green at 495 A. V., and in the violet at 425. Second: that while the non-ortho plates show the same failure at 425 it does not fail at 495.

We may consider here Nos. 13 and 13A. (See Figure 8). They convince us that the fast ortho plate is not suitable for short or under exposure in poor light conditions. The dye in the emulsion restrains the blue and violet, exaggerating the under exposure. No ortho plate yields its best results except with full timing. We cannot consider the qualities of any grade

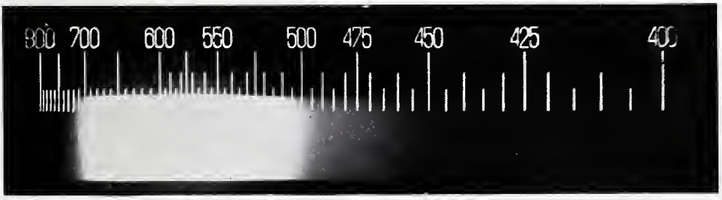


No. 1

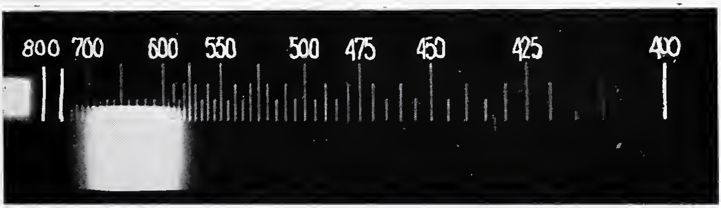
Figure 6.

No. 1. Panchromatic Plate. No screen.

of plate without observing the effect of varying exposure. Slow plates it is readily understood have great latitude, but have we not been told that fast plates have "no latitude." There are before me a series of exposures made on an extreme speed emulsion which show a variation of over 800 per cent in exposure. There are neither under or over-timing. Prints from these negatives show very slight differences. This statement is of course made contingent to the speeds of the



No. 2



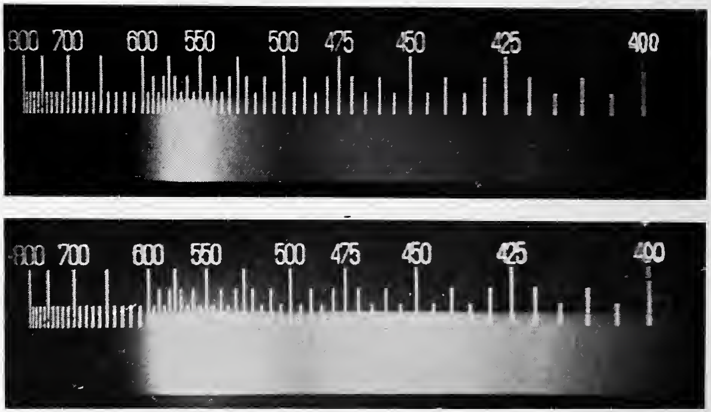
No. 4

Figure 7.

No. 2. Panchromatic Plate. Visual Luminosity Filter.
No. 4. Panchromatic Plate. Tri-color Red Filter.

focal plane shutter as marked by the maker. These are what we use for our work, possibly, rather arbitrary values, and certainly not having the efficiency we are led to expect from such a shutter. It has been shown that at a distance of ¾ in. from the plate the efficiency is as low as about 60 per cent—that of a between-the-lens type.

The results of any plate under various conditions of exposure are of course determined by the treatment in development. A tank of fresh developer yields greatly different results from the same solution after several dozen plates have been developed by it. Look at these spectrographs Nos. 64 and 48. The band is of more even and of greater density in the region of 425-440 a.u. with the old developer. In



No. 13

No. 13a

Figure 8.
No. 13. 1 sec. exp. No. 13a. 2 sec. exp.

practical use it means less density in the high lights and more satisfactory detail in the darker portions.

However correctly your ortho plate may record the image it receives it is easily spoiled by improper development. Perhaps the main fault is that many try to make an ortho negative which appears in contrasts like the non-ortho plate they are accustomed to use; forgetting that in the former the greatest density (when filter is used) will be in the yellows and whites while in the latter the greater densities come in the blues and whites, a reversal of luminosities. On landscape subjects this sort of treatment gives unsatisfactory results because with the ortho plate the whites and yellows are exaggerated towards white and the reds and blues towards black. With the plain plate the blues and whites are identical while all other colors go toward black. These troubles indicate under exposure and over-development. The cure is to give full to over-exposure and under-development with a well restrained developer which favors over-timing; such a developer is Paraamidophenol hydrochloride, par excellent. The above stated troubles with ortho plates increase with the slower emulsions and also the panchromatic plate which is of medium speed. Beginners should not meddle with panchromatic plates, they are too easily fogged, too easily spoiled by unsuitable development and likely in un-

No. 90 No. 91

Figure 9.

No. 90. Correct exp. and dev. No. 91. Under exp. Over dev.

skilled hands to give worse results than non-ortho emulsions.

I once made two exposures of equal duration, of an oil painting and with double coated plates. One of these plates was given to a dealer for development with the warning that they were double coated orthos of an oil portrait and that care must be used. The other plate was finished by myself. The artist accepted my print as a perfect copy of his work. The plate developed by the dealer was scarcely recognizable, being so dense and contrasty as to be of no use. (See Figure 9).

Some years ago Wm. Carbutt recommended the green filter for landscape work. Such a filter would need to be rather lighter than the customary tri color and the plate would need to be rather red sensitive, because green filters pass a considerable red unless very dense. Dense filters could not be used as they would give undesirable contrast, by reason of their absorption of all red and blue. A panchromatic plate and light green filter would undoubtedly give fine results, with full exposure and soft development. (See Figure 10).

While the spectrographs on fast and contrast non ortho emulsions indicate an improvement with a light greenish yellow filter, we would find in practical use on out-of-door subjects that to obtain a satisfactory rendering of the sky our landscape would in many cases be much under-exposed. The greater difficulties would come with the contrast plate because of its tendency to increase contrasts, and because the yellow filter would cut out the blue in the shadows there by making them darker.

Photomicrography offers a very serious and valuable application of panchromatic plates and deep color filters. They not only permit us to increase or decrease the contrast in portions of a highly stained specimen but they improve the working qualities of the objective by allowing us to work with nearly monochromatic light thereby eliminating the troubles which arise from chromatic aberrations. (See Figure 11).

No. 99 No. 100 No. 101

Figure 11.

No. 99. Very poor. Contrast Plate.
No. 100. Poor Rendering. Panchromatic Plate. Blue Screen.
No. 101. Correct rendering. Panchromatic Plate. Red Screen.

Light and lens systems identical in each. Note the remarkable improvement in definition due to color screens.

Photomicrograph of High Colored Copper Antimony Alloy.

No. 92

No. 93

No 94

Figure 10.

No. 92. Panchromatic Plate. Tri-color blue filter.
No. 93. Panchromatic Plate. Tri-color green filter.
No. 94. Panchromatic Plate. Tri-color red filter.

All three negatives are slightly underexposed, and are too contrasty for three-color work. Note the purple beech at A. It is best rendered by the green filter. With the blue and red it is not separated from the green trees behind. The most distant parts of the subject are rendered best by the green filter.

THE LITTLE CAMERA'S SUPERIORITY

By CHARLES F. RICE

IT'S all in the lens.

What's all in the lens?

The superiority of the little camera.

That is to say, the great depth and effective speed of the short focus lens, with which the little camera is equipped, make that type of camera superior in capability to the large instrument fitted with a long focus lens.

What the short focus lens can do is interestingly and graphically shown in motion pictures. Of course, in this instance it is a big camera, but the lens is of very short focus—usually about two inches—so the lens argument is just as good as if it were a tiny vest pocket camera. And the lens will do the same sort of work no matter what size the camera to which it is attached. Well, as I started to say, in motion pictures, if you're looking for it, you can see the tremendous depth the little lens gives. Likely as not, the principal object or figure in the scene, on which the focus is sharpest, is only a few feet away from the camera. But just look at the rest of the picture, and you will see that other objects at various distances are also in good focus. And there the camera is shooting away, sixteen exposures to the second, and the light perhaps not any too good—so you will know that the lens can't be "stopped down."

If you have had experience with a camera as large as postcard size, let us say, with a 6½ inch lens, you will know that your lens doesn't work that way when it's wide open. You'll know that if you attempt to photograph two or three people at a distance of ten feet or so, they all have to be just about on a line—at right angles to the way the camera is pointing—or one will be sharp and another will be fuzzy. This is with the lens opening of F/6.3 possibly, and you may very probably use an opening of F/11 so you will be sure all your figures are sharply focused.

Now, the 2-inch lens would without any doubt at all give

PORTRAIT. Louis Fleckenstein.

ample depth at its full opening of F/3.5. And if you figure it out you'll find that a lens working at F/3.5 is more than eight times as fast as one working at F/11. Quite a difference, isn't it?

That's practically the difference in effectiveness between a 6½ inch lens and a 2-inch lens. The 2-inch lens is eight times as effective. I would say this is a fair statement, because in nine cases out of ten, in general photography, it is important and necessary that the lens be used at such an opening that there will be some considerable leeway in the matter of depth. It won't do, unless you're copying from a flat surface, to have the sharp focus only just in one shallow plane.

Oh, I know we do see portraits done that way, where you can trace the plane of sharp detail up the front of the victim's coat, along one side of his face, through the near eye, and on a line across the hair—probably one or both ears will be woolly and the near coat sleeve is almost sure to be out of focus, and it is quite possible that if the near eye is right the off one will be considerably off. Of course that isn't true to nature—that isn't the way any normal-visioned human sees, and it isn't desirable. That's just a horrible example of the way a long focus lens works at a large aperture and rather close range. It could all be overcome or avoided by the employment of a lens of shorter focus.

We might put it another way, and say that the 2-inch lens is eight times as fast as a 6½ inch lens. It is, practically, on account of having equal depth at an opening that is eight times as fast.

Depth of focus (or field, strictly speaking) is dependent upon the actual diameter of lens opening or "stop." An aperture of half-inch diameter gives the same depth—no matter what the focal length of the lens with which it is used. One-half inch with a 2-inch lens is F/4, with a 6½ inch lens it is F/13. And F/4 allows considerably more than eight times as much light to pass as does F/13, so you see it is a very conservative statement to say that a 2-inch lens has eight times as much effective speed as a 6½ inch lens.

Objection may be made that a lens of so short focus as two inches isn't available or desirable for general photography, and that is true to some degree.

Take the standard "vest pocket" camera, making a picture 1¾ x 2½ or thereabouts. It is fitted with lenses varying in focal length from 2½ to 3½ inches, the average being 3 inches. And it will do wonderful work, mainly and principally because its lens is of such short focus. But it's just a little too small to strike the fancy of a great many serious amateurs.

Take the next larger standard size, we may call it a "coat pocket" camera, making a picture 2¼ x 3¼ inches, or if it's one of foreign make, probably 6 x 9 centimetres, which is approximately 2½ x 3½ inches. This size camera may be obtained in an endless variety of models—for roll film, or plates and film pack; and one, the No. 12 Premo, can be used with all three forms of sensitive material. The lenses fitted to 2¼ x 3¼ cameras vary from 3½ to 4¾ inches in focal length, and I would say that their practical capability is in inverse ratio to the focal length of lens. No, not exactly that. For while 4¾ isn't twice 3½, yet the 3½ inch lens has just about twice the depth, or as we put it before, twice the effective speed of the 4¾ inch lens.

With a lens of 3½ inches focal length (while, of course, it doesn't compare in depth with the 2-inch motion picture lens) the camera worker can easily do things that he couldn't touch with a post-card size outfit and a 6½ inch lens. All because of the great depth of the short focus lens. The long focus lens gives speed only by sacrificing depth, or depth only by sacrificing speed. The short focus lens gives both depth and speed together.

Imagine slow snap-shots of children in the house, holding the camera in the hand, and estimating the distance so that the focus is near enough right as close as three feet. This is no extraordinary accomplishment with a capable miniature camera having a fast lens. No other camera will do this sort of thing except a reflex, and as between the two types I vote for the miniature every time.

But don't go above 3½ inches in focal length if you want to get the full benefit of the short focus lens depth and speed. The argument for use of a long focus lens to secure better perspective doesn't apply here—because the print will be made by enlargement anyhow. The perspective is fixed once for all when the viewpoint is selected. It is the same from that view-

VENETIAN REFLECTIONS. LOUIS J. STEELE.

point, whether a short focus or a long focus lens is used. The only difference is size of image, and this can be regulated to suit in the process of enlargement.

"Take it small, then enlarge" is the modern way in photography, and it is being practised more and more every day, as more photographers see the light. The main drawback of the method, as it applies to amateur photography, is that the enlarging, which is an essential part of the process, cannot very well be turned over to anybody else. The worker ought to do his own enlarging to get the most satisfactory results, and most of us amateurs (shall I dare to say it) are too lazy for that.

But if once we get the hang of printing by projection, we shall find it has many advantages over contact printing. I prefer to say "printing by projection" rather than "enlarging." Very often I make prints with the lantern less than twice the dimensions of the original negative—say a 3½ x 5 print from a 2¼ x 3¼ negative; and I have on occasion made the print smaller than the negative. That's the great beauty of the process—we are not bound down to the original proportions. We can take just the portion of the negative that contains the picture, and make it any size we want.

One would naturally suppose that a 5 x 7 contact print from a negative made with a 7-inch lens would be practically identical with a 5 x 7 enlargement from a 2½ a 3½ inch negative made with a 3½-inch lens, both lenses being used with a stop of the same F value. But it isn't so. The enlargement will show greater depth every time, and not only that, if both lenses are anastigmats the detail in the enlargement will rival that of the contact print. And if it's high-art soft focus you're after, bless you heart, with a capable enlarging lantern you can get fifty-seven varieties of diffusion from the sharpest negative that was ever made.

I haven't said a word about the greater ease and convenience of working with a small camera. That is self-evident. Also the fact that films and plates in small size are less expensive. That needs no argument either.

The big thing about the little camera is that it delivers the goods—better goods than the big camera. I say it sincerely. And it's all because of the great depth of the short focus lens. In that sense, "it's all in the lens."

*"Along thy wild and willowed shore
Where'er thou wind'st, by dale or hill,
All, all is peaceful, all is still."*

WM. H. BROADWELL.

AN UNUSUAL CAMERA, AND WHY

By MARK W. STEVENS

FRIEND Editor came along some time ago with the request for an article for the 1921 *Annual*. I replied that I was too busy building a camera for myself to comply with his request. Back came a letter, "Write about the camera," it said, and, thinking that possibly my experience might be of interest to others of the craft, I said that I would.

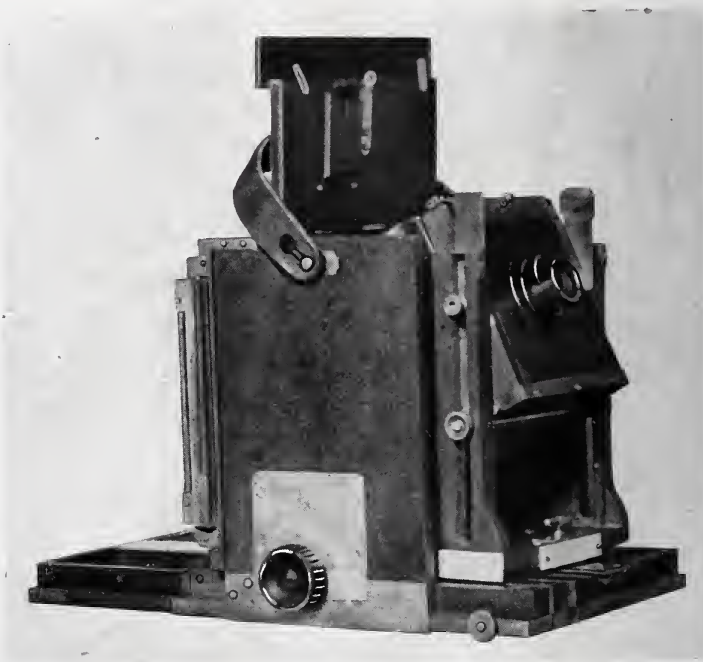
In the first place I must explain that I am a dyed-in-the-wool photographic fan. I got my first camera, an Eastman, about the size and shape of a parlor match box, about twenty-four years ago and since that time I have not been without a camera of some sort. I have had all sorts and varieties of the species from my first 1⅝ x 2½ film camera to a 5 x 7 plate camera. I finally settled down to the 4 x 5 size as the most satisfactory all-around job. It is small enough and light enough so that the camera and six plate holders are no hardship to carry on a day's hike. It is large enough so that the contact prints are of acceptable size and the definition in small details is sufficiently large to enlarge to almost any size that one may wish to make.

For the past ten or eleven years I have been using a Century Grand Senior with a Series III. Cooke Lens and Multi-Speed Shutter. This outfit with its long draw (17 inches) and double swing back was quite satisfactory, but I was constantly feeling the need for a greater range of adjustments than this outfit would permit. I have always been much interested in watching the new things in photographic apparatus, and have been particularly interested in the cameras which the English firms are putting on the market. And, by-the-way, I think that the English manufacturers cater more carefully to the wants of the amateur who desires to do really serious work with his camera than do our own manufacturers. I saw points of which I approved in some of the English apparatus, although I could find no one camera which measured up to my ideals.

Last Fall I conceived the idea that the only thing for me to

A TEMPLE OF COMMERCE. PENNSYLVANIA STATION, N. Y. DR. D. J. RUZICKA.

do was to build my own apparatus if I were to get just what I wished. So I got out my drawing board, etc., and proceeded to work out on paper an instrument that would fulfill my desires. I finally, after some time and thought, evolved a design which appealed to me as being satisfactory. I incorporated in it ideas from here and there. Some of the movements I knew just how to provide for and others for which I had to



For Short Focus Work. Front Standard Out and Back Rack Forward.

plan out a way of accomplishing without interfering with other movements and parts of the apparatus.

About the first of last March I began actual work on the Box. The design called for a 4 x 5 camera with a reversible back. It also provided for a focal length of 28 in., a front capable of being raised at least 3 in., and with a forward and back swing, to replace the swing back, having a movement of at least 20° from the vertical in each direction. There is also

THRU THE ELMS. P. F. Squier.

provided a back-focusing pinion so that for wide angle work I can advance the front nearly to the outer end of the bed and then rack the back forward into focus. This obviates the necessity of carrying an extra bed of short length for this sort of work, or of any possibility that a part of the bed would cut off the bottom of a wide angle picture. This is also a useful adjustment to have when doing copying work, as one can then keep the distance between the lens and the copy stationary at the proper distance for the size of copy desired, and the focusing accomplished by racking the back of the camera into proper focus. With this long draw and rear focusing adjustment I am able to handle any lens of 4 or 4½″ to 24″ focus with plenty of leeway.

As to the actual construction of the instrument: The woodwork is of solid Honduras mahogany throughout; the metal work all solid brass, with the exception of a few pins holding pinions on to shafts and similar positions where the added strength of steel was necessary. The outside is not leather covered, but polished like the rest of the woodwork. Instead of the usual procedure in woodfinishing; viz., staining, filling, and varnishing, this woodwork was merely stained to the deep wine red color which I desired and then given coat after coat of liquid wax. Each coat of wax being allowed to harden and then rubbed down before the application of the next coat. This method of finishing is a good deal more trouble than the ordinary procedure, but is highly satisfactory in that the fibres of the wood are thoroughly impregnated with the wax which renders the apparatus immune from the effects of heat and moisture, and, therefore, the likelihood of the warping or checking of the wood is extremely unlikely. It took seven coats of wax (and quite a bit of elbow grease) to fill the wood and give to it a nice soft polish.

The box of the camera, the main bed, and practically all of the wooden parts are made of 5/16″ mahogany. The extension parts of the bed are of ½ x ½″ section, with all wearing surfaces faced with strips of No. 14 gauge brass. This not only provides against wear on these surfaces, but stiffens the whole construction as well. The front standard is also built of 5/16″ mahogany, lined with brass against wear and for added stiffness and held at the back with brass gusset plates against spreading of the uprights. The completed apparatus, without lens and shutter, weighs but four and one-quarter pounds.

I have not attempted to give anything but the most general description of the inception and construction of this camera, as I do not feel that details of construction would be of particular interest. If this article inspires anyone else to the construction of a camera they will probably proceed along more or less different lines, suiting, as I did, their own personal ideas. They may get inspiration from my work, and they may find in it ideas which they may wish to incorporate in their own, and if they do find any such they are certainly welcome to them. Each one will have to go his own way, largely, designing the camera as he wants it, and as he may have the tools with which to construct the various parts—and I wish to say that a camera is not such a complex and wonderful mechanism, and is not nearly so difficult to build as many of us are prone to imagine. After beginning actual construction work I spent somewhere in the neighborhood of one hundred hours on the job.

I trust that this meager description, together with the cuts, will give the readers of the *Annual* a good idea of what I have accomplished in the way of building a more or less elaborate piece of photographic apparatus. If the article proves to be an inspiration to any of you to follow in my footsteps, I will say good luck to you, it's not as hard as it looks.

Camera Showing Full Bellows Extension.

Illustrating article "An Unusual Camera and Why," by Mark W. Stevens.

IN THE WINTER WOODS OF OREGON. W. C. SAWYER.

ANOTHER LENS HOOD

By THOMAS E. DOOLING

MOST modern lenses are equipped with such shallow hoods, or none at all, that a great many of us are apt to overlook the importance of this necessary addition to our photographic apparatus. A good lens hood, at least as deep as the outside diameter of the lens barrel, is a necessity for those whose aim is toward improvement of their negatives.

Lens hoods on the market did not quite suit me, so I set about designing one. I wanted a hood that was deep, simple in construction and operation, and at the same time would permit the closing of the camera without removing the hood from the lens, and carrying it as a separate attachment.

With a long strip of heavy wrapping paper (with a width equal to the distance from the front of lens ring to end of lens barrel), make a paper tube (a) with inner diameter about 1/16th inch larger than your lens barrel, and outer diameter just slightly larger than the outer diameter of the lens ring (Figure 1). With a second strip of paper (with a width equal to the distance from front of lens board to outer end of lens barrel), make a second tube (b) with inner diameter about 1/16th inch larger than outer diameter of first paper tube (a).

Cover insides of both tubes with good velvet, turning the edges of the velvet over about ¼″ on the outside of the paper tubes. With a narrow strip of wrapping paper with a width equal to the distance between edges of the velvet, build up outsides of tubes until outsides of tubes are level with velvet. Cover the outsides with heavy paper, chamois skin or thin leather—a piece of old glove, book cover, etc.

When finished the inner tube should fit closely on lens barrel, and outer tube should fit closely on inner tube. Where your camera will permit, slightly deeper tubes can be made even though, when closed, they do extend beyond the end of lens barrel.

FOG BOUND. W. T. STARR.

In using, first set diaphragm of lens (if necessary to change) by removing the whole hood, and then replace hood on barrel and extend hood as far as possible.

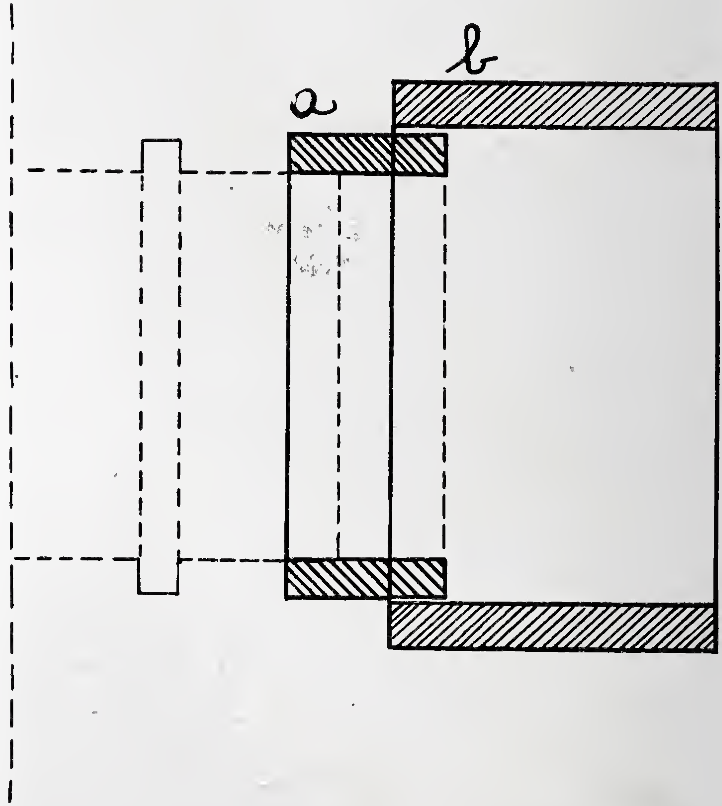


Figure I.

With little trouble an excellent hood can be made to fit your lens, although in some cases it may require slight modification of the above method.

FREDERICK POHLE.

AN UNAPPRECIATED DEVELOPER

By JOSEPH COBURN SMITH

THERE is one developer which does not seem to be appreciated as much as it deserves. When made up according to the formula given below it possesses the following good points:

1. It is made up in one stock solution which requires only dilution with water to be ready for use with either plates or papers.

2. This stock solution is exceedingly concentrated, and so is easier to store and keeps better.

3. It gives good pure blacks which are excellent for sulphide toning if care is taken to give full development.

4. It is especially free of fog, and usually no bromide is needed to insure clean whites.

5. It is much better than most developers in hot weather, as it can be used up to ninety degrees Fahrenheit without fog. At such a temperature, however, measures must be taken to prevent frilling or retriculation of the gelatine.

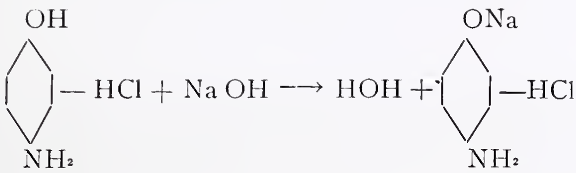
6. The image appears quickly, but full density is not reached at once.

7. Whenever its powers seem to be exhausted it can be "speeded up" by the addition of a little of a solution of sodium hydroxide. By doing this occasionally a little of the developer may be made to do a great deal of work.

8. It is fairly cheap, the price of paramidophenol hydrochloride being usually less than half that of Elon, Monomet, or the various Metols.

This developer is made by mixing paramidophenol hydrochloride, which is also sold under various trade names such as Kodelon, with sodium hydroxide which forms the true reducing agent. This has the formula of $C_6\ H_4\ ONa\ NH_2$—HCl and, for want of a more convenient name, may be called paramidosodioxibenzene hydrochloride. For those interested in chemistry, the reaction may be depicted as follows:

Phoebe Ann White.



In practice, the writer has found the following formula to give good results:

Water	5 oz.
Potassium metabisulphite	¾ oz.
Sodium sulphite	¾ oz.
Paramidophenol hydrochloride	½ oz.

A whitish precipitate is formed which is dissolved by the addition of a saturated solution of sodium hydroxide. Approximately three ounces of this will be needed to make the stock solution clear and transparent.

In use it should be diluted with 15 to 30 parts of water for plates for films, and with 30 to 50 parts for bromide or gaslight papers. However, almost any proportions may be used, if it is borne in mind that the stronger solutions give harder contrasts while the weaker solutions bring out detail better and give softer effects.

For tank development, using one part of the developer with thirty-two parts of water, the following time and temperature table will serve as a convenient guide:

Time	Temperature
5 minutes	75 degrees
10 "	70 "
15 "	65 "
20 "	60 "

If the factorial system is preferred, a factor of 18 to 22 should be used, the exact number depending upon the character of results wanted.

When used with papers a weak acid stop bath is advisable in order to neutralize the strong alkaline properties of the developer, and so preserve the strength of the acid fixing bath.

FOUNTAIN: WASHINGTON, D. C. GEORGE STEELE SEYMOUR.

AFIELD WITH AN ANASTIGMAT

By GEORGE STEELE SEYMOUR

ONE'S camera, like one's watch or one's wife, is apt to become quite a personal thing. I speak from the standpoint of the sympathetic bystander; not at all of the craftsman who can discourse impressively of jewels and balance-staves, bromides and gum-processes, but the dilettante who knows his camera as he knows his watch—by the service it gives him. (You may notice that I have prudently dropped part of my simile.) But one cannot have used a camara for twenty years without having insensibly grown in wisdom of things photographic; magazines, books and friends all join hands with *Old Man Experience* in contributing to the education of Mr. Pipp.

To the habitual camera-user like myself who, from lack of time, does not develop and print, but prefers to assume the attitude of a Faraday, saying: "The problem is solved; turn it over to the mathematicians"; the most important fact in his photographic experience is the personality of his camera. I do not mean to disparage the art of developing and printing. I have seen wonders done in those lines by a friend of mine who can spread an emulsion on the inside of a curved glass cylinder. I only say that it is a specialty in itself, the work and study of a lifetime, and I cannot find time for more than the pressing of the button, which in itself is a sufficiently complex proposition to give pause to the boldest.

I have known four cameras intimately in my life. Of them I may say that my Vest Pocket Kodak was the least satisfactory, as the pictures that it gave were too small to be of any practical use. Often I could not make out the detail in them at all, and though good enlargements could be made, this is impracticable for most negatives. My 3A Rapid Rectilinear gave good service and much of its work has appeared in this ANNUAL. But the most pleasure of all has come from a 3A anastigmat.

Of course, it is well known that at the larger stops the work of the anastigmat is very much like that of the rapid rectilinear; it is only at the .16 stop that we begin to get anastigmat results. The smaller stop naturally necessitates longer exposure, so that, if the sun is bright, a landscape at .16 stop will require .25 second exposure. This is when we get the beautiful wealth of detail that is characteristic of this lens. If you know just the right exposure for the place, the atmospheric conditions and the time of year, then you know the personality of your camera; that is to say, you know exactly what sort of response it will make to you when you press the button. It took two years before I attained this degree of acquaintance with my anastigmat—that is why I do not like to change lenses too often.

With this I am giving you some samples of the work of this much appreciated lens, taken in rambles around the country.

Here is an old temperance drinking fountain that stands at the corner of Seventh Street and Pennsylvania Avenue in Washington. It is one of my earliest boyhood recollections. It was erected in the wicked days of long ago when the drinking of water needed to be popularized. The word "Hope" on the cornice seems strangely prophetic. This view was made in bright sunlight, and the shadows of the leaves on the sidewalk aid the composition. The fountain has been manœuvred into one side of the picture by trimming, and thus an effect of distance has been secured in the view past it.

In Dover, Delaware, the camera caught a doorway in the State Capitol in a receptive mood. This building, while not an ancient one, might as well have been, as the antique style so characteristic of the section is well simulated in it. This picture shows very well the profusion of detail recorded by an anastigmat at .16, for not only can each brick be distinguished, but the markings of the various bricks also. The negative is a trifle over-exposed, for the sun was very bright, but this has not interfered with the accuracy of the prints that can be made from it.

The statuary from Saint Paul is a group representing Labor that adorns the pedestal of the Governor Johnson statue on the steps leading down from the Capitol building.

DOORWAY: DOVER, DEL.

GEORGE STEELE SEYMOUR.

The bronzes standing against the grained Vermont marble are wonderfully lifelike, and might pass for real men if the background were removed. Statuary is very hard to take, especially if set among trees, for it requires a strong and direct light. How often are statues set athwart the path of the sun with a heartless disregard of the photographer's convenience?

These are but a few samples from my growing monument to the efficacy of the anastigmat. I will show you some more next year.

THE PILLARS. OTTO J. VOLKMAN.

STATUARY: ST. PAUL, MINN. GEORGE STEELE SEYMOUR.

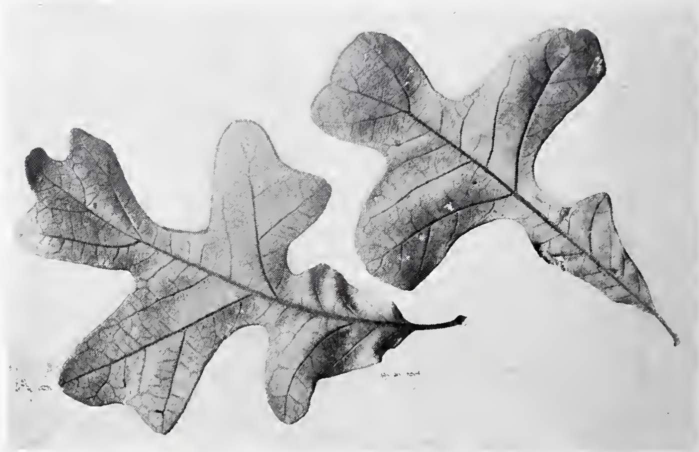


Figure 3.
LEAVES OF THE POST OAK.

Illustrating article "Photographic Selections For 1921," by Dr. R. W. Shufeldt, C.M.Z.S.

PHOTOGRAPHIC SELECTIONS FOR 1921

By DR. R. W. SHUFELDT, C.M.Z.S.

MOST of my time in these days, where a camera comes into play, is spent in the open with my wife, my love has passed to botanical and biological subjects, and of them I have made many hundreds of negatives. One of our favorite collecting grounds is along the old Georgetown Canal; and last spring I made several views of this historic locality, of which an heretofore unpublished one is reproduced in Figure 1. The scene here shown is hardly more than a couple of miles from the environs of Washington, and it is readily reached by the suburban electric cars. About five hundred yards to the right, below the towpath, one comes to the Maryland banks of the Potomac River, and all up through that region the out-of-door naturalist finds, at all seasons, much to interest him. At one place the Papaw trees grow luxuriantly; and wherever we find them we are sure to meet with speci-

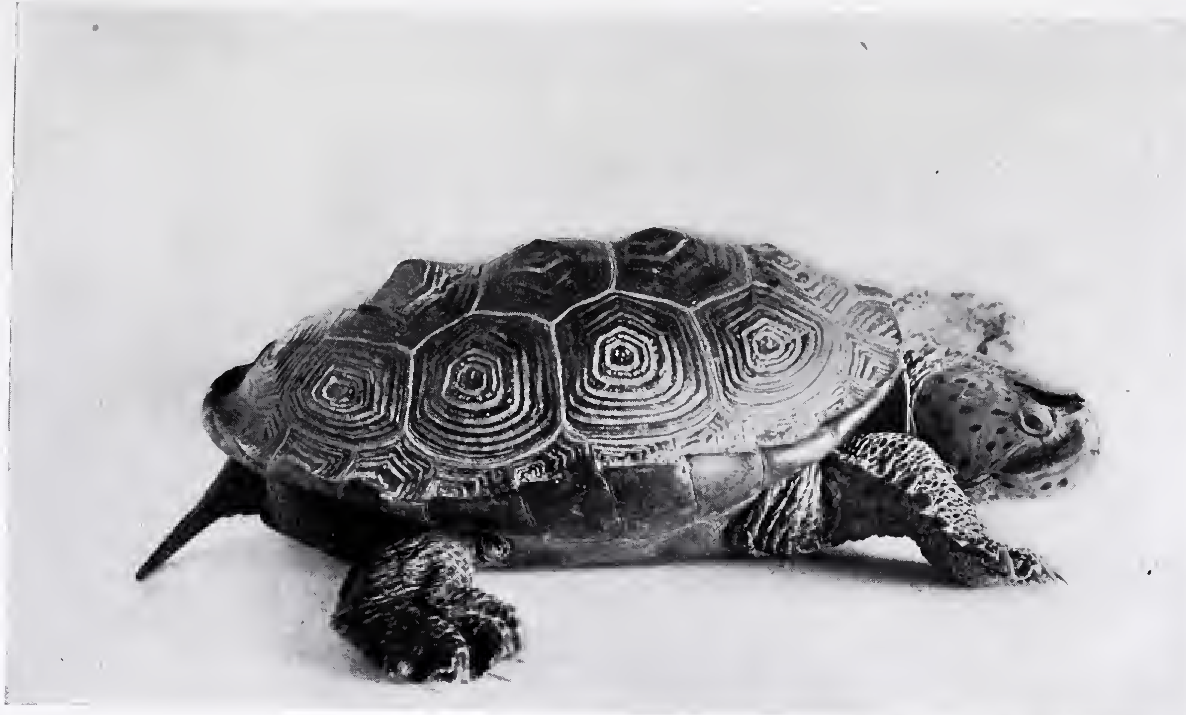
THE TOW PATH. Figure 1.

mens of the wonderful black and white Zebra butterfly, with the long tails to its lower wings, starting from a brilliant scarlet spot on either side. This insect is a great favorite with butterfly collectors on account of the remarkable variations it presents, and I have published photographs of it many times.

In the spring, flowers of many varieties are found in this region, and for this reason it is also a favorite one for the local botanists. At this season we meet with such plants as the purple Trillium in full bloom, the dog's-tooth violet, several kinds of violets, the star of Bethlehem, cowslip, and many others including some aquatic species.

Across the river, on the Virginia side and several miles below this locality, the topographical character is entirely different. At Dyke, for example, where, ages ago, a long, narrow embankment was built directly out into the Potomac for at least a quarter of a mile, the shore is low, and hundreds of acres of rushes and cow-lilies fill in, in many instances, the area between the channel and the shore. Here numbers of dainty little marsh wrens build their nests every season—sometimes repeating the task two or three times as brood after brood is reared. Usually a pair selects a bunch of stiff rushes for their future home, well away from the shore, and about two-thirds the way up from the water when the tide is in. They weave around the rushes the long, dry leaves of some slender-leaved aquatic plants, until a hollow nest is constructed with an entrance-hole at one side, which has, at a little distance away, all the appearance of a dried cocoanut and about the same size. Occasionally they build a "mock-nest," which they never occupy, but which frequently deceives any one searching for their eggs. A few seasons ago I waded into one of these places at low-water, and succeeded in obtaining a beautiful series of photographs of these interesting nests, which some day I trust to publish.

During the past year, when they were in bloom, we collected many wild flowers, and I obtained upwards of an hundred negatives of this region, the majority of them having been published in American Forestry and other magazines and works. One of the prettiest things I obtained was a perfect specimen of the flowers of the Spanish Oak, which is here reproduced in Figure 2, natural size. This is an excellent example with which to illustrate a line of photographic work that has been very much neglected in this country, that is, the study of trees and of all their parts by the aid of the camera. My experience for several years past has taught me that there is a growing demand for correct and artistic pictures of this class, coming principally from scientific foresters, nursery-men, illustrators of many kinds, and others. As to the subjects, the principal ones needed are species of trees of all sorts; taken in forest views; taken singly at all



DIAMOND-BACK TERRAPIN. Figure 4.

Illustrating article "Photographic Selections For 1921," by Dr. R. W. Shufeldt, C.M.Z.S.

seasons of the year; development of the buds and fruit; the roots, bark, and sections of the trunk (transverse and longitudinal), the leaves, etc. With respect to the latter a good example is seen in the beautiful leaves of the Post Oak, here reproduced from one of my photographs of a large series of leaves from different kinds of oaks. (Fig. 3.) To this series in my collection also belongs a fine lot of negatives giving the various forms of acorns. To be successful here, one must be familiar with our trees, and use his camera scientifically and effectively. Remember that some of the most useful photographs of single, full-grown trees are those taken when they are entirely *leafless;* the *true form* of the individual tree can only be appreciated when it is leafless.

Another class of work to which I have given a large amount of attention during the past year consists in the photography of reptiles and batrachians, to illustrate popular accounts of them for those interested in the natural history of the animals of this country. As a rule, turtles are extremely difficult subjects to photograph, where the aim is to command results that present these creatures in natural poses, and, oftentimes, with natural surroundings. Many such photographs have been obtained by me recently, and they have illustrated a series of articles published in Aquatic Life, of Philadelphia. One of the most difficult species of this entire group to photograph is the famous "diamond-back terrapin," or the species used in making the widely relished terrapin soup. Following upon four hours of hard work in my photographic room, I at last succeeded in securing the result here shown in Figure 4. It is an old female of this species, and reduced about one-half. This terrapin is an extremely nervous and excitable one, not to say restless and obstinate to the last degree. It is easy enough to secure the entire white background, for a curved sheet of perfectly clean cardboard will do that for you; but to have the animal stand upon direct lateral view, with head, tail, and all four limbs in evidence at the same instant, is quite another matter. Especial difficulty is experienced in having the specimen keep its tail in sight, as here shown in the cut. Better try it sometime, should you aim to test your own particular brand of patience.

Figure 2.
BLOSSOMS OF THE SPANISH OAK.

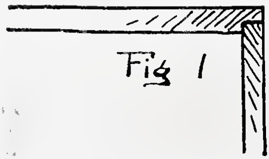
During the spring of 1920 I made a series of photographs of the mounted specimens of mammals and birds in the galleries of the United States National Museum; they have been used for both illustrative and lecture purposes, and this constitutes another line of by no means easy photographic work. Many of the mammals are of large size, as deer, antelope, rhinoceroses, and others; and being exhibited in immense glass cases, in fairly close proximity to each other, one is confronted with a number of serious difficulties when under-taking tasks of this character. We have, in the first place, the problem of the nearness of the cases to each other, which makes it extremely hard to get the entire group on the ground-glass and from the correct *point of view.* This was the case with the Zebras here shown in Figure 5—a part of the Roosevelt collection. Then comes the question of getting rid of the reflections, which in many instances it is quite impossible to do. Here we not only have the *reflections* to deal with, but the fact that in some instances we can see other cases, or the visiting public *through the one* which we desire to photograph. Notwithstanding all these hindrances and difficulties, however, I have succeeded in obtaining some good results. Through controlling the light from the dozen or more immense windows; temporarily roping out the visitors at the time, and through the judicious use of big and uncreased sheets, much can be accomplished in this way. The results, if satisfactory, are well worth the while, as are all the material and patience one expends upon them.

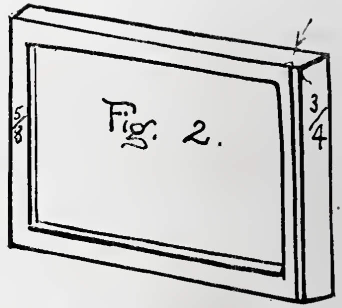
Figure 5.

MOUNTED AFRICAN ZEBRAS.

Illustrating article "Photographic Selections For 1921," by Dr. R. W. Shufeldt, C.M.Z.S.

UNDER THE BRIDGE. GEORGE STEELE SEYMOUR.





Illustrating article "An Easily Made Camera For Marine Work," by E. A. G. Smith.

AN EASILY MADE CAMERA FOR MARINE WORK

By E. A. G. SMITH

ATTENTION to the following instructions, and a little careful labor, will provide any reader of the *Annual* with a camera especially well adapted to marine photography and at small expense. Its bulk is its chief objection, but its efficiency and small cost will go far to offset its lack of compactness. The accompanying pictures were made on 8 x 10 plates with such a camera, and during many years of use no failures occurred through any fault of the camera.

It is evident that the plan of construction can be employed for any size camera, but for various reasons one for use with 6½ x 8½ or 8 x 10 plates will be found most satisfactory.

For a lens I would recommend one of not less than twelve inches focal length, and one of sixteen inches for either of the size plates mentioned. A lens with a working aperture of F/8, or even F/16, will give excellent results with good light and a suitable shutter. Place the lens you decide to use upon a view camera and focus carefully so as to get the foreground and middle distance of your view as sharp as possible.

Next measure very carefully from the center of the back of the lens to the ground-glass. This measurement must be

A SHEPHERDESS OF THE ARGONNE. T. W. Kilmer.

correct. Construct a box of well seasoned wood 3/16 of an inch thick, with sides joined as shown in Figure 1, and of such dimensions as will give a snug fit for your plate-holders. Make the length of the box about two or three inches longer than the measurement made from lens to ground-glass. Glue together and nail. Make the front end of the box to fit in place in the same way. In the center of this end cut a hole for your lens. With the lens mounted on the box measure and mark the *exact* distance, on the inside of box, that you obtained in measuring from lens to ground-glass. This will give you the point at which your plate must be when using the camera. Remove the slide from your plate-holder and measure from the face of an old plate, placed in the holder

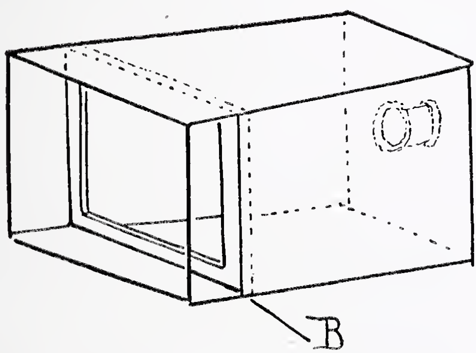


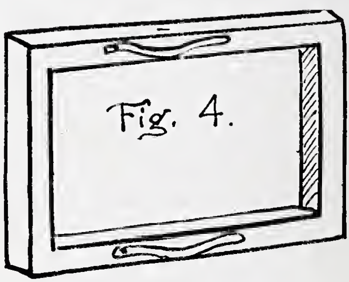
Fig. 3

for the purpose, to the outside edge of plate-holder. Make another mark inside the box, on the side of the mark previously made, that is toward your lens. This will give the exact point where the edge of the plate-holder must be to bring the plate at the point of focus.

Now construct two frames like Figure 2 of ¾ x ⅝ stuff. Cut a groove (A) in one frame as shown, and of such shape and depth as will take the light cut-off on your plate-holder. Then fasten this frame *exactly* in place on the line you last marked, and as shown by B in Figure 3.

Next fasten two brass springs on the remaining frame and in the manner shown in Figure 4. Good *spring* brass from the back of an old, small printing frame will do. Fasten these at one end only with a screw. Place a plate-holder in position in the box, and be sure it is snugly against the first frame, and with the light cut-off in the groove. Against the back of the plate-holder place the frame with the springs against the holder. Fasten it in place where it will hold the plate-holder firmly in place and yet allow sufficient room to withdraw the plate-holder by pressure against the springs.

Paint the frames and entire inside of box with a dead black paint. The back end of box may now be fitted in place, and if hinged to the box it is possible to arrange to button extra plate-holders inside the camera on each side and easily get at them. Paint the outside of box with a good waterproof paint, or if it is likely to have excessively hard usage, it may first be covered with heavy cotton cloth soaked in a rather weak solution of glue, and stretched tightly over the



box and then painted. On the top of the box a finder should be placed as shown at C in Figure 3.

This may be made from a spectacle lens and only such portion of the view as corresponds to that shown on the groundglass allowed to show in the finder.

A shutter working between lenses or one working in front of lens may be used. I used a Thornton-Picard Special of the latter type very successfully. In use the camera should be held against the breast at a height that will bring the top with finder about on a level with the eyes. In this manner it is possible to watch the object being photographed and the reflection in the finder almost simultaneously, which is a great advantage of the direct finder.

Although originally constructed especially for marine work, this camera may be used for many other kinds of work.

Illustrating article "An Easily Made Camera For Marine Work," by E. A. G. Smith.

Figure 1.

Illustrating article "An Experiment With Paper Negatives," by H. V. Schieren.

AN EXPERIMENT WITH PAPER NEGATIVES

By H. V. SCHIEREN

PAPER negatives are not new for they have been used by pictorialists a great many years. Many amateurs seem to think, however, that they are difficult to make and not worth the trouble. The following example is given to show the simplicity of the process and the results which may be obtained with little effort.

Figure No. 1 is a contact print from a 2¼ x 3¼ Graflex negative. It was of necessity made in a hurry as the cloud effect did not last very long. Upon development the negative was found to be badly marked with tiny pin holes, due to the fact that the plate used had been left for some time in the plateholder and had collected considerable dust. The dark cloud and the hillside seemed to offer possibilities, but of course the small size of the picture precluded any attempt at pictorial effect without recourse to enlarging.

Upon projection on the enlarging easel the pin holes were greatly magnified and spoiled the picture, and the fact was

Figure 2.

Illustrating article "An Experiment With Paper Negatives," by H. V. Schieren.

also brought out that the barn was a very unsightly object and did not add to the artistic effect, but rather detracted from it. By means of a direct positive an enlarged paper negative was made and worked up on the back with soft pencil and stomp as shown in Figure No. 2. The unsightly building was thus eliminated and some of the values of the negative slightly altered so that with a little spotting on the finished print, the picture shown in Figure No. 3 was produced.

The procedure was so simple and the tools used so easily procured that the whole process took only a very short time, and the result seemed to amply repay the time spent.

It is often cited against the use of the paper negative, that it takes an extremely long exposure to make a print from it, but in these days of high power electric lamps, this is not a serious drawback. Any thin bromide paper answers admirably for this work and if greater printing speed must be had it is very easily obtained by coating the back of the dry negative with a mixture of paraffin and turpentine, rubbing it in thoroughly and allowing it to dry for a moment before printing.

The picture reproduced in Figure No. 3 was printed from a paper negative made on thin bromide paper, on Artura Carbon black at a distance of about three feet from a 300 Watt Tungsten lamp with an exposure of fifteen seconds. The paper negative was not treated in any way to make it more translucent, but was just ordinary thin stock.

Many small negatives which would otherwise be quite useless may, by this method, be made into attractive pictures. If the work is carefully done the grain of the paper need not show to any great extent, and as a matter of fact a slight grain is not an objection, as it adds atmosphere to the picture and enhances the pictorial effect.

STORM CLOUDS. Figure 3.

Illustrating article "An Experiment With Paper Negatives," by H. V. Schieren.

GETTING THE NEWS PHOTOGRAPHS

By FREDERIC FELIX

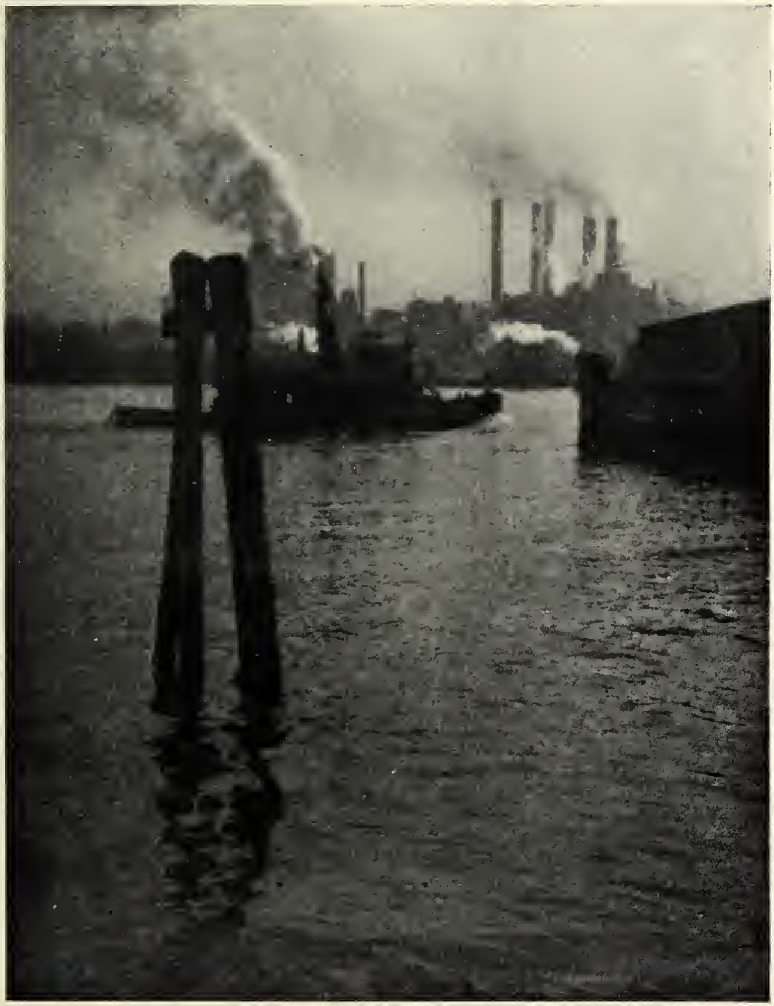
IN years, within the easy memory of most of us, there was a time when photography had not developed very far from the cumbersome wet process. Dry plates, films and hand cameras had to await a rather slow adoption by the general public and were not, by any means, accepted so readily as is a new whistling air from vaudeville, or a new game.

But, as is so plainly evident, the acceptance of the advanced methods grew with such sureness and rapidity that a camera is to-day more certain of being found in an individual's equipment than is a time-piece.

Omnipresent, and one might almost say omniscient, photography is advancing the education and gratification of mankind to a wonderful extent. Motion pictures make everything explainable, and bring any one portion of the earth to the convenient inspection of the farthest opposite corner. Photomicrography tells almost how and what we think. Other variations of the art do other wonderful things for us.

One of the most effective advances is in the manner of illustration of books, periodicals, newspapers and advertising material. In former days the publication of a book with illustrations called for artists and engravers, each of special standing in his profession, whose tasks required the use of much valuable time, and whose product added much to the cost of production. In the same period newspaper illustrations were practically all line drawings. Even after the present-day photographic half-tone engravings became easily possible, many publications used line work in order to make sure that there would be no disappointments in printing qualities from their engravings during the course of a long run.

In place of rushing a photograph to the engraving room and having it transferred to printing block form by the rapid process now universally used, the print, in those days, was



THE EAST RIVER, NEW YORK. Dr. D. J. Ruzicka.

sent to an artist who traced its outlines with indelible ink, then faded out the silver surface image beneath the outline, and sent the resultant black and white image to the line engraver.

To-day, when everyone from infants to nonogenarians is either operating some kind of camera, or is considered entirely entitled to be so doing, a retrospect would seem to indicate the photographers of early days were slow and plodding. But, with limitations and encumbrances in consideration they were doing as enterprising and worthwhile things as the best in the profession to-day. Going as far back as civil war days the example of Mr. Brady in making his great collection of negatives among the Union armies is a praiseworthy illustration. Following the soldiers and trying to get all of importance in which they were engaged, by means of an equipment that necessitated wet baths, a changing tent and so on, was decidedly a different proposition from the present possibility of the magazine camera that needs only intelligent pointing, together with shutter releases repeated almost without limit. It is gratifying to know that Mr. Brady's negatives, now quite priceless, are preserved for all time in the vaults of the War Department at Washington.

At present there are so many photographs and illustrations that the world would be dead indeed were it possible for some evil genius to eliminate all of them instantly, and to prevent their return, even for a short period of time. It would seem almost as calamitous as the dire prospect held before us of the sun's ceasing its activity in the heavens.

The finest and most valuable medium for the circulation of photographs in large numbers, and of timely interest, is the weekly pictorial section which over fifty newspapers throughout the country are issuing regularly. The reproductions are, in most instances, of the finest quality and the space given to the pictures so generous that not only is a most interesting and highly educational presentment made for the public, but an active and profitable market for any who wish to dispose of photographs.

The magazines, books and other publications of high class are most generous in their photographic offerings. And the daily newspapers and other issues from the printing press, using lower grade paper which does not allow such satisfactory reproduction of photographs, are doing wonderfully well and are most generous with illustrations. Some daily papers rather specialize upon pictures, and are running several dozen half-tone reproductions in each issue. The New York American includes a daily page solid with reproduced photographs among its other pictorial offerings. The News, of New York City, prints an average of thirty-five half-tone pictures daily. Large size rotogravure sections, such as the New York Times issues, use seventy or more photographs at a time and present them in a manner equalling the best book illustrating.

The use of photographs for illustration has grown until the work of making, collecting and selling them to the various publications has long since been a regular business for many firms and individuals. There are possibly a hundred such agencies in New York City, which is the center and headquarters of the organized industry. Most of the activities in other sections of the country are branches of New York City institutions.

George Grantham Bain was a pioneer in the development of the system of connecting with all interesting photographic possibilities, and laying the resultant prints before the art editors so speedily, and in such attractive form that they cannot fail becoming purchasers. At present Mr. Bain operates somewhat differently from most of the others. He has a large number of subscribers throughout the country who are charged a definite and regular fee, and who are supplied with a certain number of photographs daily or weekly. Thus assured a definite financial income, Mr. Bain is able to make easy calculation upon getting his pictures together, and his subscribers receive them at much less cost than the separate print sale plan used by others in the business. His plan is mentioned as a suggestion to photographers who may wish to make their first entry into the agency work.

Thirty-five or forty years ago Messrs. Underwood and Underwood, brothers, engaged in making collections of double photographs for use in stereoscopes, as an educational feature for sale to schools, colleges and so on. They proceeded in the work until the entire globe, country by country, had been included and their collection had mounted to possibly 100,000 negatives.

Figure 3. THE INTERNATIONAL FILM SERVICE.

SINKING OF THE GERMAN BATTLESHIP "BLUCHER."

The International Film Service paid $1,500 for the photograph and the rights of its reproduction.

Illustrating article "Getting The News Photographs," by Frederick Felix.

As illustrating with the half-tone process advanced to its modern plan the firm was repeatedly called upon to supply a view of some scene, place or building that would improve a book or article. For years their credit line, "From a stereograph copyrighted by Underwood & Underwood," was universally seen. The continuation of such calls for photographs induced them to develop all the possibilities of a business thrust upon them. They next provided lay-out groups, that is collections of from several to a dozen prints showing some certain customs, industry, peoples or activities, and sold them to publications wishing to illustrate special articles. Next came a collection of all the prominent men of the day, and after that they added the taking of events of news interest as they were happening daily all over the world.

At present the organization has possibly 400,000 negatives on hand and can meet almost any demand at a moment's notice. Many of the photographs on hand have never been used. and if called for now would have original publication. Some are sold for exclusive publication, but most of the pictures of this and similar organizations are supposed to be sold over and over again as often as there is any need for them.

Branches and agents scattered all over the world are keeping busy constantly in the supplying of photographs that will interest the buyers upon the many illustrated publications. Numerous prints are received and purchased from amateurs and others not of the organization. A good photograph, interesting and exclusive, sells itself and all photographers not already having a connection of the kind will be gratified on finding how attractive such markets may be made after the first introductions and tests have been carried out.

According to the claim of Underwood & Underwood, the finest group of news photographs ever made came from Frank Hurley and illustrate the sinking of the south polar ship "Endurance," as Sir Ernest Shackleton rescued its twenty-two men from death and starvation. One of the photographs of the ship in the ice is presented with this article (Figure 1). It was taken by flashlight, aided by an oil fire burning near the ship's prow.

Photographs should be at least of post-card size—unless an extraordinary subject cannot be offered in any but a smaller

Figure 4. THE INTERNATIONAL FILM SERVICE.

ARTILLERY AT CHATEAU THIERRY.

One of a set of eight photographs for which the International Film Company paid $1,000 for second reproduction rights after Leslie's had paid $3,000 for first rights.

Illustrating article "Getting The News Photographs," by Frederick Felix.

measurement—and they should be printed with all possible detail of the negative brought out clearly. It is very important to supply each print with a short and very clear list of particulars. The details should tell what the picture is, its date, its location, the features that make it of interest and value, all stated in such manner that the editor may easily understand the entire picture story and be able to communicate it, in turn, to his patrons as the work appears in print.

That news photographs are good soldiers of fortune, and will go through any kind of a risk is shown by the accompanying picture (Figure 2) of one of the Underwood & Underwood men as he poised himself, with his camera, upon the steel framework of an unfinished building on lower Fifth Avenue, New York City. Even were it granted that the man could have found a picture at a safer point, the effect cannot be discounted from a point of bravery.

An accepted photograph is copied by the agency taking it, the negative being made larger or smaller if desired to vary what the original offers. New prints are made for sending out to the agency's purchasers of photographs. Assortments of prints are supplied regularly to art editors all over the country. Those selected out of a group submitted are paid for and the others returned to the agency as evidence that no one is using them. When purchased prints are reproduced they must bear the credit and copyright line of the agency. Most photographs of importance are copyrighted by the owning agencies, not only for protection against having the pictures reproduced by those not buying them, but also to make sure the desirable advertising of the credit line is included in the publication of the prints.

Photographs submitted by an amateur, or those not connected with an agency's organization, are usually paid for at the general rate of $3 each, though something decidedly striking and valuable in news and pictorial interest will bring a higher return, running up to $50 or more.

The International Film Service, which, like other agencies, operates along the lines that have been detailed, bought, through its London branch, the picture of the sinking of the German battleship "Blucher" from an amateur for $1500. A reproduction of the print accompanies this article (Figure 3).

Figure 1. FRANK HURLEY.

Copyright by Underwood & Underwood.

Sir Ernest Shackleton's ship "Endurance" going down in an ocean of ice near the South Pole. From a set claimed to be the finest group of news photographs ever made.

Illustrating article "Getting The News Photographs," by Frederick Felix.

The International also paid $1000 for second rights to a series of eight photographs first to show the wonderful Franco-American activities at Chateau-Thierry, doing so after Leslie's Weekly had paid $3000 for first rights to the set. One of the set of prints is also here reproduced (Figure 4). Such examples show that circumstances making a photograph of world importance will increase its money value in proper proportion.

Good advice to amateurs who wish to produce and dispose of their work for publication is to make sure of the importance of the negative, to produce a good print, to caption it adequately, and then rush it off without a minute's delay to the agency or publication that may buy it. In selling to an agency the identity of the worker is lost, as the agency's credit line appears without including the name of the photographer, as a usual thing, but the sale to an agency is perhaps surer because the agency has close connection with a large market. Selling direct to the publications is quite possible, and there is no reason why an amateur cannot make connections with leading purchasers the same as the agencies, especially if something valuable, exclusive and timely be offered.

Paul Thompson, Western Newspaper Union, Brown Brothers, Kadel & Herbert and The Keystone View Co., are operating along the same lines as mentioned. Edwin Levick, in addition, devotes much attention to marine subjects, and to clean amateur sports. The Central News is an active organization in this country, but is principally a branch of the London headquarters of the same name, which has among its distinctions the exclusive right to submit pictures of English royalty and its affairs to publishers. In our country Harris & Ewing occupy a position somewhat similar, as they control the White House picture possibilities.

In earlier days there was more opportunity for brilliant work of distinguished camera operators and their individuality stood out in prominence, but the agency plan is engulfing personality, as so many other commercial changes have done. Women have made good records in the illustrating field, as may be supposed, and many examples of their excellent work could be given. Jessie Tarbox Beals, when a press photographer, years ago had many accomplishments credited to her. Once, at dusk she found Sir Thomas Lipton and party at the

Figure 2. UNDERWOOD & UNDERWOOD.

What a news photographer will do. An Underwood & Underwood operator balanced on a new building construction extending out over Fifth Avenue, New York City.

Illustrating article "Getting The News Photographs," by Frederick Felix.

railway station, and, having no flash powder, she secured a fine photograph by inducing them to stand motionless while she counted ninety. Again, when a celebrated murder trial was barred to photographers she built up a platform of tables and boxes and secured seven good exposures of the court room proceedings through a transom before the irate sheriff discovered her.

The divisions of the subject of press photography can supply many interesting articles. This is only a limited reference, but it is hoped it may prove an incentive to some not in the activity of illustrating to enter it.

WINTER DECORATIONS. WILFRED HICKMAN.

IRVING S. LOVEGROVE.

STAINS ON NEGATIVES AND PRINTS THEIR CAUSE, PREVENTION AND REMOVAL

By J. I. CRABTREE

Research Laboratory of the Eastman Kodak Company

ALMOST every one of us has discovered that after storing away an apparently perfect negative, at some time later it developed an ugly brown stain, or after developing a batch of prints in the dark-room on turning up the white light the prints were seen to be stained yellow for no apparent reason. The prints were easily made over again, but the negative as far as we knew was ruined. Or we had the only existing copy of a valuable photograph which in the course of years had developed a stain and we wished to have several copies made but we did not know how to go about it. It is the purpose of this article to explain how and why such stains are produced, how to prevent them, and whenever possible, how to remove them.

Classification of Stains.

Broadly speaking a stain is any deposit, foreign to the photographic image, which will absorb light and is, therefore, capable of producing an image during printing, although in everyday language, the word stain is usually associated with something colored. A photographic stain can therefore be considered as a deposit on a photographic positive or negative whose color is foreign to that of the photographic image. This definition would therefore include colored spots, irregular colored markings, and general stain.

General gray stain or fog has been covered in a previous article on "Chemical Fog" (See American Annual, 1919). The matter of spots will be dealt with in a future paper so that in this article we will consider a stain as a fairly large deposit whose color differs from that of the image and which may be "local" (when it is not uniform) or "general," in which case it is uniform and of even density over the entire film.

For purposes of reference, stains have been classified according to their color and the remarks apply to all photo-

"Over the hills to the poorhouse."

graphic sensitive materials including films, plates, lantern slides, paper prints and motion picture film. All of these are coated with a gelatine emulsion which after developing and fixing consists of a layer of gelatine in which is imbedded an image of silver, or one of its compounds. In the remarks below the word "film" has been used synonymously with such a gelatine silver image.

WHITE STAINS

These may be of four kinds:

1. *A White Powdery Scum.* If this is removed by washing it consists of hypo crystals and is due to insufficient washing of the film. If it is insoluble in water, and therefore not removed by washing but is dissolved by sodium carbonate or acetic acid, it consists of aluminum sulphite. This solubility test can easily be made by placing a drop of a 10% sodium carbonate solution on the edge of the film and then washing by dipping in water. If on drying the film is clear, then the deposit is most probably aluminum sulphite providing an alum fixing bath was used.

The acid fixing bath most commonly used consists of a mixture of alum, acetic acid, sodium sulphite, and hypo, or in other words, a mixture of hypo and aluminum sulphite dissolved in acetic acid. If sodium carbonate is added to this the acid is neutralized forming sodium acetate, and as soon as the amount of acid in the bath falls below a certain critical value the aluminum sulphite comes out of the solution turning the bath milky and deposits as a white sludge, which settles on the surface of the film and is not removed in the wash water.

Since developer is carried over to the fixing bath by the film, only a definite number of plates or prints can be fixed before the critical point is reached and the precipitation of the sludge commences. At temperatures around 65° F. usually a further quantity of acid hardener may be added to the fixing bath to compensate for this developer carried over, though in warm weather there is danger of sulphurization (See below).

In order to prolong the life of the fixing bath and prevent the formation of aluminum sulphite it is therefore advisable to:

(a) Rinse the film between the developing and fixing so as to remove as much developer as possible.

CHARLES W. DOUTT.

(b) Use a developer containing a minimum amount of alkali.

(c) Use an acid stop bath between the developer and fixing bath. Stop baths should always be used with discretion, otherwise an excess of acid is carried over to the fixing bath which in turn causes sulphurization.

A 2.5% solution of sodium bisulphite forms a useful stop bath, though the following hardening stop bath is to be preferred.

	Metric	*Avoirdupois*
Potash chrome alum.......	15 grams	½ ounce
Sodium bisulphite..........	15 grams	½ ounce
Water to..................	1 liter	32 ounces

In time this bath will deposit a sludge as a result of contamination with developer, when it should be thrown away.

If the aluminum sulphite sludge still appears after observing the above precautions, then either the acid hardener was not mixed correctly (probably too little acid was added) or the acid used was not up to strength, or too much sulphite was used.

Precipitation may take place on the print or negatives with a very alkaline developer even when the fixing bath is clear if no stop bath is used. This is due to the fact that precipitation occurs before the developer has time to diffuse away from the film. A rinse or stop bath in such a case is absolutely essential.

Removal of Aluminum Sulphite Stain.

In view of the solubility of aluminum sulphite in caustic soda, or sodium carbonate, the scum is easily removed by bathing the film for a few minutes in a 5% solution of sodium carbonate and washing thoroughly. If the temperature is above 65° F. it is advisable to harden the film for 2 or 3 minutes in a 3% solution of formalin and then wash before the above treatment.

2. *Yellowish White Opalescence.*

This particular stain is usually visible only on negatives or transparencies, and gives the negative the appearance of having been made on opal glass or celluloid. The deposit is insoluble in water, acids, and sodium carbonate and is not removed by bleaching and redeveloping (See below). The stain consists

THEODORE EITEL.

of finely divided or colloidal sulphur and may be due to one or more of the following causes:

(a) Too much acid or too little sulphite in the fixing bath. When acid is added to hypo sulphur is thrown down as a yellowish white precipitate, but this may be prevented by the presence of sodium sulphite which dissolves sulphur. If, therefore, the proportions of acid and sulphite are not correct in the fixing bath, or if impure sulphite is used or an excess of acid is added to the fixing bath, either directly or as a result of using a stop bath which does not contain sulphite, sulphur is gradually precipitated, and this precipitation takes place likewise in the gelatine film.

(b) The fixing bath is too warm. A correctly compounded fixing bath will keep for only a comparatively short time at temperatures above 85° F. The only remedy is to renew the bath as soon as sulphurization begins.

(c) The use of a plain alum bath either before or after fixing will often cause sulphurization, because alum behaves like an acid towards hypo. If the alum bath must be used, the film should be washed free from hypo before treatment.

Removal of Sulphur Stain.

A fresh sulphur stain may be removed by immersion of the film in a warm solution of sodium sulphite. A 10% solution is satisfactory at a temperature of approximately 100° to 120° F. It is, of course, necessary to superharden the film by bathing for 2 or 3 minutes in a 5% solution of formalin and washing thoroughly before treatment.

3. *Silvery White Opalescence.*

This peculiar stain is formed when drying negatives or transparencies by means of denatured or wood alcohol and especially if the drying is hastened by means of heat. This phenomenon has been attributed to various causes, including the use of impure alcohol, or alcohol containing rosin, insufficient fixing, or washing of the film, the presence of calcium salts in the wash water, etc., but although these factors may influence the amount of opalescence produced, they are not the determining factors, since it is possible to obtain severe opalescence by immersing a film of plain gelatine in pure grain alcohol and drying at a temperature of 95° F. The amount of opalescence produced is greater the more rapid the drying and the higher the temperature of drying, but it rarely occurs even if the film is insufficiently fixed and washed if drying is conducted at 70° F.

The opalescence is apparently due to precipitation of the gelatine by the alcohol to a dehydrated modification which is also produced by adding alcohol to a solution of gelatine in warm water. Hard gelatine is more readily precipitated than soft gelatine.

The precipitation is also produced by strong solutions of hypo, sodium sulphite, etc. When fixing a negative in a strong solution of hypo containing an excess of acid hardener, the fixed out film often appears milky, especially in warm weather, though the milkiness disappears in the wash water when the precipitated gelatine returns to the hydrated modification. This opalescence will often appear when removing sulphur stains with a warm solution of sodium sulphite (See above) but disappears on washing.

Removal of Opalescence

Immersion in water and drying at normal temperatures removes the opalescence completely. When drying with alcohol, opalescence rarely occurs if the film is thoroughly fixed, washed, immersed in a mixture of 90 vols. of alcohol and 10 vols. of water, surface dried, and then dried in a fan at a temperature not exceeding 70° F.

To summarize: It is, of course, possible for two or more varieties of white stains to be present on the same film. To remove an unknown stain, therefore, the film should first of all be fixed in plain hypo, washed, and bathed in a 10% solution of sodium carbonate and washed to remove any aluminum sulphite. If a stain still persists this is due to sulphur, and is removed by first hardening the film for 2 or 3 minutes in a 5% solution of formalin, immersing in a 10% solution of sodium sulphite at 110° to 120° F. and washing.

4. *Yellowish White Stain.*

The particular stain in question occurs only on old D. O. P. prints, the effect being a faded appearance chiefly in the high lights where there is least silver, and the color of the image is usually yellowish white. This stain which develops with age is due to the conversion of the silver image to a yellowish white modification of silver sulphide. That such a modification does exist can be shown by immersing a piece of well washed unexposed printing-out paper, the emulsion of which consists essentially of silver chloride, in a 2% solution of sodium sulphide. Prolonged action of the bath produces a yellowish white image whose color resembles that of the stain in question.

The formation of the silver sulphide may be due to either internal or external causes. Internal agents are usually insoluble thiosulphates left in the print from insufficient fixing and washing as explained above. Owing to the action of the atmosphere and moisture these thiosulphates are oxidized, and at the same time the silver image of the print is converted to silver sulphide.

If the print is fixed in a sulphurized bath which is slowly depositing sulphur, caused by too much acid in the fixing bath, or by the use of a too strongly acid stop bath (See sulphur stains above), the sulphur is left in the print even after washing, and this combines with the silver image to form silver sulphide. The comparative ease with which the silver image of a print is sulphurized as compared with a negative image is due to the fineness of grain of the print image.

External agents are sulphureous gases in the air such as sulphuretted hydrogen, while the hypo in the mount of a print may be decomposed and act in a manner similar to that of the thiosulphates left in the print as outlined above.

If prints are thoroughly fixed in a fresh acid fixing bath, which is perfectly clear and not depositing sulphur and then thoroughly washed the stains may be entirely prevented.

Removal of the Stain.

The removal of the stains, or rather the restoration of the image to its original color, is often a very simple matter but may also prove to be a complicated procedure.

The image of the stained print may consist of several substances including unchanged silver, silver sulphide, possibly oxidation and silver stain (See below), undissolved thiosulphate, and possibly silver photo-halides. Usually bleaching and redeveloping as in the case of the removal of oxidation stain (See below) will thoroughly restore the print, though

AN AUSTRALIAN BEAUTY. S. WITHRINGTON STUMP.

in a severe case proceed as follows:

Remove all dirt from the print by dabbing with a piece of stiff dough made from wheat flour. Grease marks can be removed with benzol, or gasoline, and the print finally rubbed over with alcohol. If the print is mounted, detach it from the mount by first thoroughly soaking in water, and then placing face downward on a sheet of smooth paper and tear the mount away from the print. This is important, otherwise if an attempt is made to pull the print away from the mount it will inevitably be torn. If the print is dry mounted, heat in a press and strip.

Now, fix the print thoroughly in plain hypo to remove any undissolved silver halide, wash thoroughly, and then harden by bathing for 2 or 3 minutes in a 3% solution of formalin and wash. If the highlights are stained this is due to silver stain which should be removed in a 2% solution of potassium cyanide, removing the print as soon as the image begins to be attacked. (Cyanide is a deadly poison and should be used with great care). Then wash thoroughly. The print should now be bleached in the permanganate bath and redeveloped as recommended for the removal of yellow stain (See below). The permanganate bath converts the image consisting of silver sulphide to silver chloride and this develops to a black silver image in the redevelopment.

YELLOW STAIN

This may be of two kinds. (1) developer or oxidation stain, and (2) silver stain.

1. Developer or oxidation stain is caused by oxidation products of the developer which are transparent like a yellow dye. The stain may be either "local" or "general." Owing to the fact that printing papers are usually sensitive chiefly to blue light which is strongly absorbed by a yellow color the stain acts as if a yellow filter were placed over the negative. Local yellow stain, therefore, causes the image on the print to be weaker in those spots where the stain is present.

General yellow stain which covers the entire film just as if the film had been uniformly dyed yellow has no harmful effect other than to increase the printing exposure.

Local Developer Stain.

All developing agents, such as, Elon, pyro, hydroquinone,

THE STORM, SHIPROCK, NEW MEXICO. GEORGE L. BEAM.

etc., have the property of readily combining with oxygen especially in alkaline solution to form oxidation products which are invariably colored yellow or dark brown, and which have the property of staining gelatine just like an aniline dye. When a developer is exposed to the air oxidation takes place and the developer turns yellow more or less rapidly according to the temperature, the nature of the developer and the amount of surface of developer exposed.

The oxidation products, however, can in turn be reduced back again to a colorless condition by substances like sodium sulphite or bisulphite so that if the developer contains an excess of sulphite the rate of formation of the oxidation stain is slow and usually proportional to the amount of sulphite or preservative present.

Apart from aerial oxidation, during development the developing agent is being used up by virtue of its reducing action in changing the exposed silver salt to metallic silver and in so doing it is oxidized itself, the product formed being usually identical with that produced by aerial oxidation. The amount of oxidation product formed in this way is, of course, proportional to the amount of silver, so that the photographic image is of a duplex nature consisting of a stain superimposed on a silver image. That such an image exists can be readily seen by immersing a pyro developed negative in Farmer's reducer which removes the black silver image leaving a yellow image which is composed of the oxidation product of development. The utility of this stained image is explained below.

Most developers form such a stain image though with developers like glycin whose oxidation product is readily decolorized by the sulphite in the developer, the stain image is very feeble.

The oxidation product, apart from being colored, has the property of tanning gelatine, so much so, that if a negative developed with, say, caustic hydroquinone is placed in hot water, the gelatine in the clear and unhardened portions dissolves away leaving a relief image.

Local irregular shaped stains are caused by local oxidation of the developer which may be due to:

1. Careless handling of the film by incomplete immersion in the developer or fixing bath. A slight curl of the film or print, or too many films or prints in one tray, will leave some


THE PORTALS OF ETERNITY. WILLIAM LUDLUM.

part of the surface exposed to the air, oxidation will take place and a yellow patch will appear corresponding in size to that of the portion of the emulsion exposed to the air. In motion picture work if the top of the film rack is not thoroughly submerged an oxidation yellow stain is produced which appears on the film at regular intervals. To prevent such stains it is obviously necessary to completely immerse the films or prints in the developer or fixing bath.

2. An alkaline fixing bath. Since a developer oxidizes more rapidly in alkaline than in neutral or acid solution, as the acid in the fixing bath becomes neutralized by the developer carried over by the film, this developer oxidizes more and more rapidly and stains the fixing or stop bath. When the fixing bath froths readily, it is probably alkaline and should be thrown away, though in some cases, it is possible to renew the acidity by adding further amounts of acid hardener at intervals.

It is always important to move prints or films around in the fixing bath so that the alkali in the developer in the print is killed at once by the acid in the fixing bath. If the prints or films are simply thrown into the bath and allowed to remain at rest, the developer clings to the film and the acid in the bath is not strong enough to completely neutralize it, so that the developer oxidizes and stains the film locally wherever there is an excess of developer, and especially if the film is locally exposed to the air.

An acid stop bath between developing and fixing is an almost certain cure for local developer stain (for formula see aluminum sulphite stain above). This neutralizes the alkali in the developer in the film before it reaches the fixing bath, thus reducing the tendency for further oxidation.

General Developer Stain.

This exists uniformly over the entire surface of the film and is caused by

(a) Old or discolored developer or a developer containing an insufficient amount of sulphite or impure sulphite. General pyro stain is the most common on negatives.

In the case of prints, general yellow stain is produced if development is forced in a warm developer, or in a dirty tray, or if the prints are rinsed too long after developing and before fixing.

NOONDAY MEAL. BLANCHE C. HUNGERFORD.

(b) The use of a plain alkaline fixing bath.

Removal of Developer or Oxidation Stain.

This can be removed in two ways (a) chemically (b) photographically.

(a) If the oxidation product of the developer (oxidation stain) is treated with an acid solution of potassium permanganate it is oxidized further to a colorless substance which is soluble in water. Such an acid solution would dissolve the silver image also, but if sodium chloride is added, the bath converts the silver image to one of silver chloride while the stain is being oxidized. If the silver chloride image is now exposed to light and developed in a non-staining developer, the original silver image is restored free from stain.

To remove developer stain, therefore, proceed as follows:

First harden the film by bathing for 2 or 3 minutes in a 5% solution of formalin and wash for 5 minutes, otherwise the gelatine is apt to soften and frill during the subsequent treatment. Then bleach in the following:

		Metric	*Avoirdupois*
A	Potassium Permanganate......	5 grams	75 grains
	Water to....................	1 liter	32 ounces
B	Sodium Chloride (Table Salt)..	75 grams	2½ ounces
	Sulphuric Acid (Conc.).......	15 cc	½ ounce
	Water to....................	1 liter	32 ounces

A 5% solution of hydrochloric acid can be used instead of solution B; but as it is often of uncertain strength its use is not recommended.

The solutions A and B keep well if kept separately, but not when mixed, and for this reason the bleaching-bath should be prepared as required.

When preparing the solution A, be sure that no particles of undissolved potassium permanganate remain, for they will cause spots and blemishes in the negative.

The bleaching should be complete in about 3 or 4 minutes when there is usually left a general brown stain all over the film due to manganese oxide, and especially in those parts previously occupied by the image. It is best to remove this stain by placing in a weak solution, say, 1% of sodium bisulphite. Then rinse and develop in a *strong light* (daylight if

THE BRIDGE AT DUSK. JESSIE TARBOX BEALS.

possible) with an ordinary developer, say Nepera solution one part, water four parts.

When removing stains by the above procedure markings caused by drying a negative without removing the drops of water (water markings) are usually removed also unless the markings are of long standing.

(b) Local yellow stains may be removed photographically by superimposing a deep yellow filter over the negative and making a positive from this in a printing frame on a panchromatic plate just as when making a paper print from a negative. A suitable filter is the Wratten G filter film and a suitable plate is the Wratten Panchromatic, both of which are manufactured by the Eastman Kodak Company.

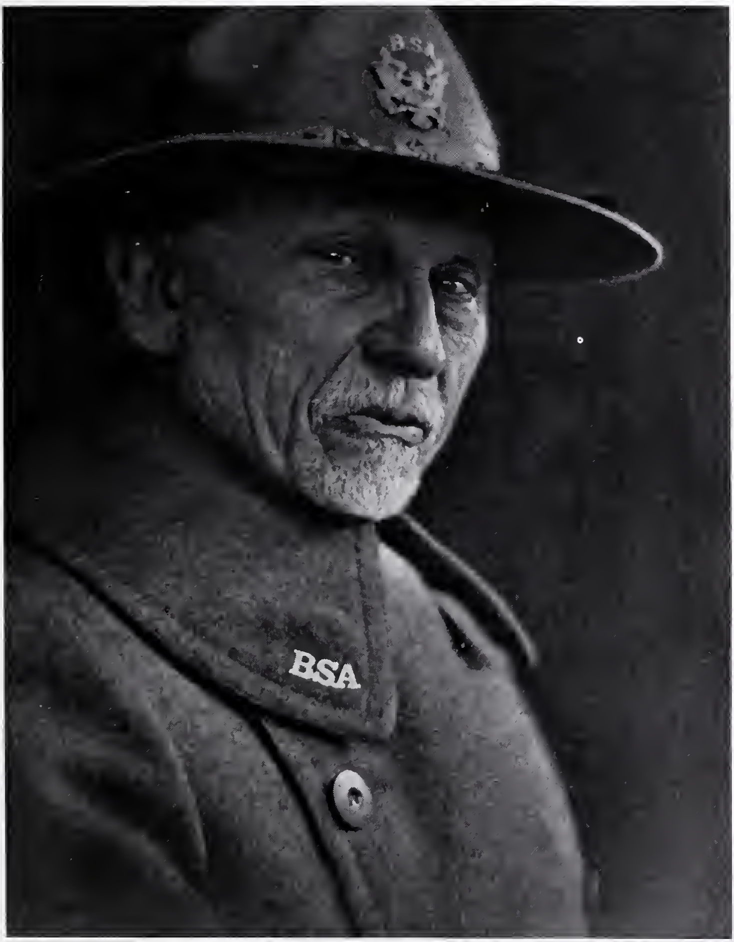
The panchromatic plate is sensitive to light transmitted by the G filter and in turn the G filter is of a deeper yellow than most yellow stains which are, therefore, eliminated providing the stain is completely transparent. If the stain contains any gray deposit the filter will, of course, only filter out the yellow color from it.

An alternative method is to illuminate the negative by transmitted light as when copying or making an enlarged, reduced, or full sized positive, and use a sheet of the filter film or a filter mounted between glass over the lens. In this case a piece of filter only slightly larger than the diameter of the lens mount is required.

Filter film consists of dyed sheets of gelatine and when not mounted between glass should be kept dry and free from finger marks.

After the positive is made it is a simple matter to make a duplicate negative on, say, Eastman Commercial film or a Seed 23 plate in the usual way.

It is possible to remove almost any colored stain from a negative or print in a similar manner by a suitable choice of filters provided the stain in question is not muddy as if it were mixed with a black medium. It is simply necessary to choose a filter such that on viewing the stain through the filter, the stain becomes invisible. Thus, a red filler should be used for a red stain and so on, taking care to use a panchromatic plate, which is sensitive to all colors. In the case of a blue black ink stain a blue filter will cut out only the blue. It is better to re-



DAN BEARD. A. O. TITUS.

move such stains by chemical means.

Usefulness of Developer Stain.

Although most photographic stains are objectionable, a de-

Figure 1.

veloper stain image which is formed *in situ* along with the silver image during development as explained above is often of great value because it is capable of producing a print just in

Figure 2.

the same way that a print is produced by a silver image. Photographic papers are usually sensitive to blue light only which is strongly absorbed by a yellow stain, which therefore

THE RIVER BANK. C. E. Wakeford.

behaves photographically like a black image. Figures 1 and 2 illustrate this point. Figure 1 is a print from a pyro stained negative. This negative was then placed in Farmer's reducer until all the silver was removed leaving a yellow stain image. Figure 2 is a copy of a print made from this stain.

Of course, pyro is not the only developer which will give a stain image. Developers such as hydroquinone, or oxyisocarbostyril, give warm brown and reddish oxidation products, and these can be utilized in obtaining warm tones by direct development.

The oxidation products of a developer like monomethyl paramidophenol sulphate (Elon) are powerful fogging agents so that if it is attempted to produce a stain image with such a developer so much general fog, and therefore general stain, is formed that the stain image is entirely hidden.

The printing value of a stain image explains why an apparently weak looking pyro negative will give good prints on a soft printing paper. This is because the stain which appears transparent and weak to the eye is really opaque photographically.

So far as it has been possible to determine, a pyro stain image merely intensifies the black silver image and does not otherwise alter the photographic quality, so that usually the same result in printing can be obtained by prolonging development of the negative, which result can also be attained by intensification.

The question is often asked, therefore, as to whether it is better to develop for a longer time in a non-staining developer like metol hydroquinone or for a shorter time in a staining pyro developer. If it is desirable to always duplicate results as in the case of developing motion picture film in a deep tank, a non-staining developer is desirable because under these conditions it is impossible to duplicate results with a staining developer as explained below.

Control of Developer Stain.

It is practically impossible to obtain a stain image which is free from general stain and vice versa. The proportion of general stain to image stain depends on the following factors:

1. The quantity of sulphite or preservative in the developer. The greater the quantity of sulphite present, the less is the

stain produced and vice versa.

If the developer is old it rapidly becomes highly colored and then produces general stain with little or no silver or stain image because the developer has been largely converted to oxidation products which will not develop an image.

2. The time of rinsing between developing and fixing. A long rinse permits further oxidation of the developer by the oxygen dissolved in the wash water and this produces general stain.

3. The nature of the fixing bath. Since sulphite or bisulphite bleaches out stain and prevents oxidation of the developer, an acid fixing bath, therefore, destroys both general stain and the stain image. Hence, in order to produce the maximum amount of stain image, use a fresh developer, rinse quickly between developing and fixing, and fix in a large volume of fresh hypo.

The following pyro formula when used fresh will give a good stain image with a minimum of general stain.

	Metric	*Avoirdupois*
Pyro	5 grams	75 grains
Sodium Sulphite	2.5 grams	40 grains
Sodium Carbonate	10 grams	150 grains
Water to	2 liters	64 ounces

Develop for 6 minutes at 65° F., rinse and fix in a plain hypo bath.

The above reasons explain why it is impossible to produce pyro stain with precision on a practical scale such as in deep tank work. As the developer becomes older the proportion of oxidation stain to stain image changes which in turn changes the quality of the negative.

If a negative is stained too strongly, the stain may be reduced by first removing it entirely by bleaching in a permanganate-chloride bath as above and instead of developing in a non-staining developer use a mildly staining pyro developer. This procedure usually gives more general stain, however, in proportion to the stain image than if the original emulsion had been developed with the staining developer in the first place.

2. *Yellow Silver Stain.*

MARTIN VOS.

Another form of yellow stain is due to compounds of silver left in the film after fixing and washing. It is difficult to distinguish silver stain from oxidation stain by ordinary observation, though it is usually less transparent and is more of a dirty yellow color. Like oxidation stain it can be either local or general and may be due to one or more of the following causes.

1. The use of an old and exhausted fixing bath containing an excess of silver in solution so that if the film is not sufficiently washed, some of the silver salt remains after drying. This compound is colorless, but is gradually changed to yellow silver sulphide on exposure to the air. To prevent such stains, therefore, it is important to use only fresh acid fixing solution.

2. Incomplete fixing. This can occur with a new fixing bath, if the print or film is removed from the fixing bath too soon. While the film is fixing, the silver halide in the emulsion changes first to a colorless silver thiosulphate (hypo is sodium thiosulphate) which is not readily soluble and at this point the milkiness of the emulsion disappears. Further action of the fixing bath converts this difficultly soluble compound to a more soluble double thiosulphate of silver and sodium which is readily washed out of the gelatine film. If, therefore, the film is removed from the fixing bath as soon as the milkiness has disappeared, which is the first stage of fixing, prolonged washing will be necessary to remove the relatively insoluble silver salt so that normally some will remain in the film and this in turn will be changed to silver sulphide by the action of the sulphuretted hydrogen in the air. Any undissolved silver halide will on exposure to light be changed to photohalide.

The only safe rule is to leave all prints and negatives in the fixing bath for double the time necessary for the milkiness to disappear and then wash thoroughly. Very minute traces of silver left in the film can be detected by the sweetness on tasting a corner of the film.

3. If the film is not completely immersed in the fixing bath, it may appear to be completely fixed, though in spots it may only be fixed as far as the first stage with the result that on exposure to the air and light yellow stains appear.

4. A common cause of silver stain when handling roll film is developing and fixing with two lengths of film placed back to back. Although this may save space, it is false economy,

O. C. CONKLING.

because it is impossible to wash the backs of the films which stick together. The result is that hypo containing silver is left in the gelatine backing which turns to silver sulphide on exposure to air, so that while the emulsion side of the film is clear the gelatine backing is stained.

Removal of Yellow Silver Stain.

Silver stain cannot be removed by bleaching and redeveloping as in the case of oxidation stain, because this has simply the effect of converting the yellow silver sulphide to silver chloride and then to silver so that the yellow stain is changed to a black stain of metallic silver.

There is no way of always completely removing silver stain, though the following methods are frequently successful:

1. After thoroughly washing to remove any hypo, bathe the film in a 1% solution of potassium cyanide. Remember that cyanide is a deadly poison and a solution in water emits fumes of poisonous hydrocyanic acid so that it should be used only in a well ventilated room. The cyanide will dissolve any silver thiosulphate present and some silver sulphide, though in time it dissolves the silver image so that the film should be removed from the bath and thoroughly washed as soon as any signs of reduction of the image appear.

In the case of an old negative treatment with a weak solution of acid permanganate, washing, and then immersing in the cyanide will often remove obstinate stains.

2. Copying the negative or print through a G filter as described above will reduce, but not always completely remove silver stain.

To summarize. A yellow stain may consist of one or more of the following substances, silver sulphide, silver thiosulphate, silver halide or photo-halide together with oxidation products of the developer. If it is decided to attempt its removal first make a copy through a suitable filter in case the photograph is ruined in the subsequent treatment. Then find out by a preliminary test the exact nature of the stain. This is done by cutting a narrow strip from the edge of the film, washing and bleaching and redeveloping as above. If the stain is entirely removed and is not replaced by a black deposit, the stain is pure oxidation stain and the entire negative may be treated in this way. If the stain is only partially removed, treat the nar-

THE SNOW-BOUND BROOK. EDWIN A. FALK.

row strip with cyanide as for the removal of silver stain, wash well, and if a transparent yellow stain remains, treat this as for oxidation stain. The degree of success in removing the stains from the narrow strip will serve as a guide to the procedure necessary for the rest of the negative.

YELLOWISH BROWN STAINS.

These are usually caused by contact with iron or iron rust. In the case of motion picture film if the iron film reel on which the film is usually wound is rusty the rust is scraped off during re-reeling and settles between the convolutions of the film causing the stain. The stain may be identified by placing a drop of a 50 per cent solution of nitric acid on the stain and then adding a drop of ammonium thiocyanate. A deep red coloration indicates the presence of iron.

The stains are usually removed by bleaching and redeveloping as when removing developer stain.

BROWN SCUM.

This occurs in deep tank development when developing roll film or motion picture film. If the developer does not contain enough preservative, a layer of insoluble oxidation product of the developer forms as a scum on the surface and this is picked up by the film.

The scum forms most readily on the surface of the fixing bath if it is allowed to stand for any length of time, for instance, over week end. When this is exhausted and contains an excess of silver salts, the sulphuretted hydrogen in the air reacts with the silver thiosulphate at the surface of the liquid forming silver sulphide which floats as a scum. This is picked up when the film is immersed in or withdrawn from the solution.

The scum has a peculiar appearance under the microscope and is characterized by a series of cracks or fissures which are formed when the scum is broken up on immersion of the film in the tank. Figure 3 shows an enlargement of such a scum in which the cracks or fissures are very pronounced.

GREEN STAIN.

This is another term for dichroic fog which appears as a yellowish green and sometimes reddish metallic sheen by reflected light or when looking at the film and pink by trans-

Jared Gardner.

mitted light or when looking through the film against a source of light. In view of this dual character it is called dichroic or two-colored fog.

When examined under the ultra microscope the fog is seen to consist of ultra microscopic particles which by chemical analysis have been shown to consist of metallic silver. The size of the particles determines their color by transmitted light,

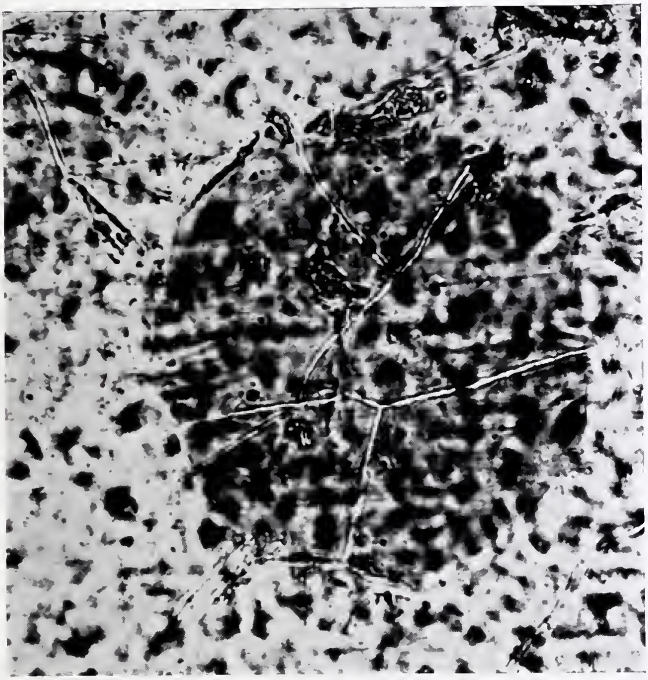


Figure 3.

those that are red in color being smaller than those which are green and blue.

Dichroic fog is always formed either in the developer or fixing bath.

(a) In order that the deposition of fog may take place in the developer some solvent of silver bromide, such as hypo, ammonia, or an excess of sulphite or carbonate, must be present when under certain conditions the dissolved silver is reduced to metallic silver in a very fine state of division, particularly in the shadows or unexposed portions of the emulsion where no bromide is liberated during development. A pyro-ammonia developer is very apt to give dichroic fog especially with fine grained emulsions for this reason.

Fine grained emulsions in which the grains of silver halide are very small, and, therefore, more readily soluble are most susceptible to this form of fog, especially if the development is forced.

(b) Dichroic fog is most generally formed in the fixing bath, especially if the fixing bath is not acid, or if it is old and exhausted, when it contains an excess of dissolved silver and spent developer. In such a case, as the silver halide is slowly dissolved out of the emulsion, it is reduced to finely divided metallic silver by the developer present. It is possible to get dichroic fog with a fresh fixing bath of plain hypo, because the silver salt is redeveloped back to dichroic silver by the developer carried over by the film to the fixing bath. This is especially true if the gelatine coating of the film is abnormally thick, and if the developing and fixing solutions are warm. The developer does not have time to diffuse out of the gelatine film before the hypo begins to dissolve away the silver halide, which is reduced *in situ* to dichroic silver. A slow fixing emulsion is apt to give dichroic fog for the above reasons.

The formation of green fog in the fixing bath is also facilitated by the presence of ammonia so that a fixing bath containing ammonium chloride (which is sometimes added to accelerate the rate of fixing) will give fog unless the bath is kept acid by virtue of the ammonia liberated by the action of the alkali in the developer carried over by the gelatine film.

Dichroic fog can also occur in a fresh fixing bath if two films or prints stick together face to face, thus forming local pockets containing developer. Such a condition is ideal for the formation of green fog, namely, an insufficiency of hypo in the presence of an excess of developer.

Stencil effects are some times produced in the shadow portions of a negative or print when another film with dense lettering adheres to the film in the fixing bath. The result is that the film is covered with dichroic fog except in those places where it was in contact with the lettering. This is because the developer in contact with the clear portions of the lettered

THE SOUTH COAST, N. S. W., AUSTRALIA. ARTHUR DARING.

negative is comparatively fresh, but wherever the lettering occurs, the developer is comparatively exhausted, so that no fog is formed in the region of the lettering, thus producing the stencil effect. The potassium bromide which is locally formed in excess in the region of the lettering (as a product of development) also tends to retard the formation of the fog, thus accentuating the stencil effect.

Prevention of Dichroic Fog.

Dichroic fog may be prevented as follows:

(a) By keeping the fixing bath acid by renewing at frequent intervals and if possible rinse the film well before fixing, or use a stop bath between developing and fixing. In this way the quantity of developer transferred to the fixing bath is reduced to a minimum.

(b) By adding potassium iodide to the developer, say, 1.5 grams per liter or 20 grains per 32 ounces. This has the effect of converting any silver halide dissolved by solvents in the developer to silver iodide, which is reduced to silver only with difficulty so that the tendency for dichroic fog to be formed is restrained.

Removal of Dichroic Fog.

Since dichroic fog consists of particles of silver in a finer state of division than the particles composing the image, they are more readily attacked and therefore dissolved by solvents of silver such as potassium cyanide, acid permanganate, etc. Advantage may be taken of this fact in removing the fog as follows:

(a) Bathe the film in a 1 per cent solution of potassium cyanide and rub the film gently with a tuft of cotton. As soon as any visible signs of reduction of the image occur wash well in running water. (Note previous remarks about poisonous nature of potassium cyanide).

(b) In place of cyanide the less toxic thiocarbamide, or thiourea, may be used. This works best in an acid solution such as the following:

Thiourea	1 gram	15 grains
Citric Acid	1 gram	15 grains
Water to..................	100 cc.	3 ounces

(c) Treat the film with a weak solution of Farmer's reducer

J. ANTHONY BILL.

made by adding a little potassium ferricyanide to a 5 per cent solution of hypo, or with a weak acid permanganate solution.

(d) An ordinary acid fixing bath will slowly dissolve silver especially in warm solution. This can be readily seen by placing a print in a warm solution of acid hypo when the image will be appreciably reduced in a very few minutes. A hypo bath is, therefore, useful for removing dichroic fog. Allow the film to stand in the hypo bath if necessary for 24 hours or longer until the fog is removed, though the action can be hastened by gently warming.

BLUE-GREEN STAIN

A general bluish-green stain is often caused by an exhausted

Figure 4.

chrome alum stop bath or fixing bath at high temperatures, especially with certain grades of matte paper. The remedy is to use a fresh bath at normal temperatures because there is no known way of subsequently removing this stain.

MISCELLANEOUS STAINS

Blue stains on sulphide toned prints caused by particles of iron are in the class of spots and will be dealt with as such.

Deep lemon yellow stains are often caused by insufficiently fixing glossy prints developed with a non-abrasion developer containing potassium iodide. The potassium iodide converts the surface layer of the silver bromide emulsion to silver iodide, which is deep lemon yellow and which fixes much more

SIDNEY V. WEBB.

slowly than silver bromide and does not darken on exposure to light.

The stain may usually be completely removed by bathing in a fresh fixing bath.

Stains due to aniline dyes, indelible pencils, and red and black writing inks are removed by bleaching and redeveloping as above or photographically. In the case of some samples of red ink a slight trace of stain remains after the chemical treatment, but this can be removed photographically. Figures 4 and 5 illustrate how ink stains may be removed by chemical treatment. Figure 4 is a copy on an ordinary plate of a photograph stained with "waterproof" red ink.

Figure 5 is a copy of the same photograph after the red stain was removed by bleaching in the permanganate chloride bath and redeveloping. No sign of the stain is visible.

Figure 5.

Illustrating article "Stains On Negatives And Prints, Their Cause, Prevention And Removal," by J. I. Crabtree.

THROUGH THE VEIL OF SNOW. L. D. SWEET.

On The Long Trail

By HERBERT WHEATON CONGDON

There's a long, long trail a-winding
Into the land of my dreams—

THE painter may put his land of dreams on canvas, but the photographer needs something concrete. There *is* a real Long Trail, and it leads through a veritable dream-land, where the early sunlight scatters the mists from amongst the yellow birches, where still peaks are half hidden, half revealed, by lazy clouds that drift across clear blue skies and where sombre cliffs are reflected in the spruce-guarded depths of quiet lakelets. Here the good photographer may think he has reached his Happy Hunting Grounds, with an infinite variety of material to work upon.

And this paradise is nearby. You may dine on Broadway and break your fast the next morning three thousand feet up in the Green Mountains, where your retreating auto is the last sign of civilization that you need meet until such time as you choose to "go out" again. You will find well-marked trails laid out by artists in that little-known art, equipped by the generosity of others for your use, with crude but sufficient shelters where you will provide your own food, fuel and bedding. Here you may bid defiance to time-tables and schedules

THE END OF THE ROAD. HERBERT WHEATON CONGDON.

and the endless argument over the relative merits of Standard and Daylight Saving Times!

The Long Trail of the Green Mountain Club of Vermont runs from the Massachusetts border about two hundred miles northerly, a footpath over the tops of the ranges, to within sight of the Canadian line. It is free to anyone who desires to use it, membership in the Club conferring no privileges save that of sharing in the expense of building and maintaining this wonderful playground. Part of it goes over State land, part through private holdings, the generosity of whose owners deserves the reward of proper care of their property by those who use it. The southerly portion runs through high plateau land and has a distinctive beauty, the beauty of trails through deep woods and beside brawling streams and quiet ponds. North from the vicinity of Rutland the hills grow more rugged and lofty, a number rising above tree-line. In this portion streams and lakes are fewer, but the numerous springs give an abundance of pure drinking water. Just before the northern terminus of the Trail is reached, it passes over Mount Mansfield, the highest peak in the State, and having in the tiny Lake-of-the-Clouds, one of the highest bodies of water east of the Rockies.

The Vermont wilderness is a long, narrow one: while its length is reckoned in hundreds of miles, its breadth is but a dozen or so. It is crossed by three railroads, and by perhaps a dozen highways, and there are many back farms whose pastures lie high up on the slopes of the Green Mountains; therefore the places for going in and coming out are more numerous than in any other wilderness-land, and while it is truly wild country, it is readily accessible; this is its strong point.

Practically all of it is a camping proposition. In the Mount Mansfield region there are "camps" and a hotel that make it possible to travel light and sleep indoors, but elsewhere one sleeps out. The southern part is not very well equipped with camps: in the Bennington section those that exist are kept locked, and the keys must be borrowed from a store in that city. The middle part, from Rutland north, is well provided with open lodges, however, many being equipped with bunks, tables, simple cooking utensils and even stoves in several instances, conveniences that lighten the pack decidedly. Here

THE MARKSMEN THREE. HERBERT WHEATON CONGDON.

the hiker may spread his blankets and cook his grub, always remembering to leave a day's supply of good fuel behind him for the next wayfarer.

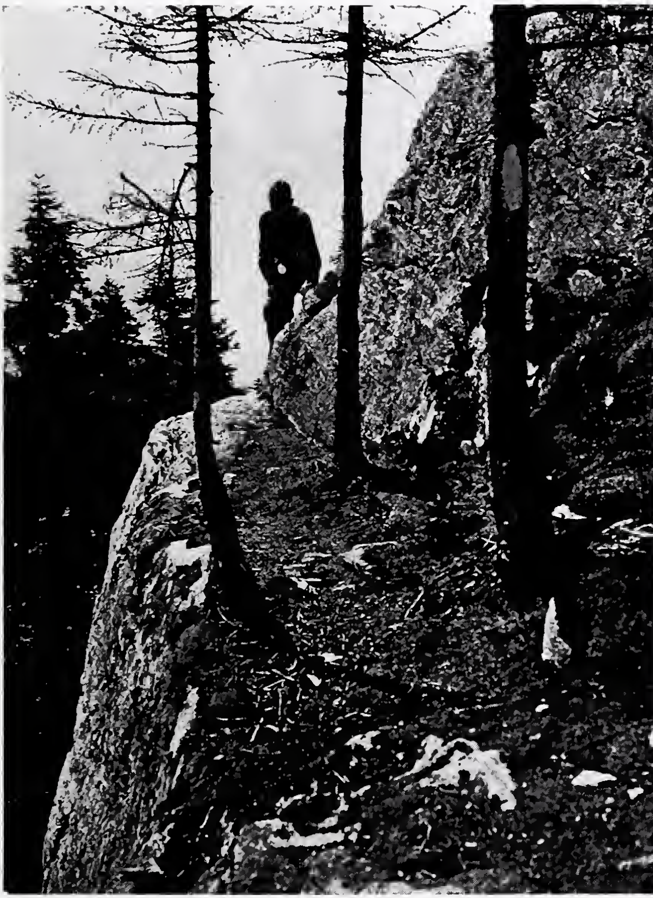
Hiking with a pack is strenuous work, and ten miles is a hard day's work. For that reason, most of the camps are a good deal closer together, which gives the photographer more time to linger on the Trail and gather material for future exhibition pictures. If the trip is to be enjoyable it must be prepared for; a greenhorn should have an old-timer with him, and even the old-timer should plan well in advance. Lightness of the pack is next in importance to comfortable footgear, and

Figure 1.

although it may not always be necessary to cut the handle off one's toothbrush to save weight, it is the sum of the little savings that lightens the pack.

Photographic equipment will be studied from a new viewpoint. The big view-camera and heavy lens do not belong on such a trip, and even in small sizes, glass plates are a nuisance where rough usage is the rule. There is no opportunity to get new supplies, and he is indeed strong-minded who can resist making exposures by the dozen! After a good deal of experience, I have settled on an equipment that suits me exactly, however it may appeal to others.

It consists of a roll-film camera making 2¼ x 3¼ negatives, equipped with an F/4.5 anastigmat and very high grade of



NARROW IS THE WAY.

shutter, the fast lens being required to permit the use of the camera in the hand when using a ray-filter, a necessary adjunct to any distance photography. This camera goes in a tan sole-leather holster case worn on the left hip (Figure 1) where it is out of harm's way, and of a depth that permits me to carry a roll of film wrapped in a thin piece of leather to protect it, beneath the camera. On the right hip I wear a similar leather holster meant for the V. & P. Kodak, which is just the right size to carry five rolls of film in their foil and paper wrappers; thus equipped I may make 42 exposures.

I invariably carry a tripod of some sort, as a large number of pictures require slower exposures than can be made with a camera held in the hand. Exposures are based on these indicated by a light-meter, which with my ray-filter, I carry in a leather case in a shirt pocket. The most desirable time for pictures, when shadows are long, is a tricky one in which to guess at exposures. My ray-filter has a factor of 10, and without its aid few distant views would be worth taking, and even in forest interiors it is of great value if wind conditions

GLEN ELLEN LODGE.

make the greatly lengthened exposures possible. Under average conditions I find that a distant view with average foreground is properly exposed at 1/25th. second at F/4.5. Towards the end of the afternoon four or five times this is required; and of course if there is much foreground and it is at all dark, with many spruces for instance, more exposure will be needed.

Possibly the most useful attachment that I take is one of the little devices that trips the shutter at a predetermined

AUTUMN LANDSCAPE. Lawrence Baker.

interval after it has been set in operation. This makes it possible to get into my own pictures, and it is astonishing how much easier it is to sell a landscape with figures than one that is just an empty view, even if they have not been related to the rest of the picture perfectly. Few editors will consider an "empty picture" I find, preferring one with figures poorly composed to the finest sort of a landscape without figures; and if the chief object of the picture is your own and your friends' pleasure, the same is true.

There are times when it is not possible to set up the tripod so solidly that the shutter may be tripped by hand without setting up vibrations that would blur the picture, in which case the shutter-tripper is invaluable. Few persons seem to realize that most blurred pictures are not the fault of focusing, half as often as they are due to movement of the camera during the brief interval that the shutter is open. No amount of stopping-down will stop this, of course, and the innocent camera gets the blame!

A refinement that I have found well worth while is a table of depths of focus at varying distances and with different stops. The newer models of a certain make of camera are equipped with such a table, but as much of my work is either for lantern slides or for enlargements, I have calculated my own for a finer definition (smaller circle of confusion) and have drawn it on the outside of my case under the protecting flap, using waterproof ink. Where distant landscape is to have a foreground of rocks or human figures, this will assure satisfactory results in the negative, as far as relative sharpness is concerned.

In working with a small camera, technically perfect negatives are, of course, the photographer's aim, as with these almost anything can be done in the home studio, while with such small negatives defects are almost incurable. If exposure and development are correct, one has still to overcome the bugbear of dirt; and the constant jarring to which the camera is exposed on The Trail seems to "soak in" all dust that may arise from the fine forest humus when sliding down or crawling up hill. Every time a new film is inserted, therefore, be careful to clean the inside of the camera thoroughly, and once in a while the holster, too. It will pay.

At the same time be on the lookout for leaks in the bellows, where the finder or cable release may wear the leather during the constant jolting. A little pocket search-light held inside the camera at night will show them up, and a bit of surgeon's plaster will cure them, applied to the *outside* of the bellows where its white color will not set up any fog-causing internal reflections. Shading the lens while making exposures will also go far to aid in the brilliancy of the resulting negative, especially in the case of pictures that are taken towards the sun.

Exposures made by meter seldom go far astray, yet the human element enters even here, and there is a chance that in "exposing for the shadows" some of the delicate nuances of distant hill-forms or cloud-shadows may be lost.

As negatives made with slow exposures and a ray-filter are apt to be very rich in gradations, I generally reduce the "normal" time of development to about eighty-five per cent. of that given for the "normal" pyro tank developer, in order to get the most out of the negative and avoid clogging the high-lights. For the same reason a very correct exposure of the print is necessary, with full development; and it may be said in passing that there is no paper like smooth platinum for getting the most out of a negative. Usually people think of this medium as one for large exhibition prints only. Try it on your little negatives, cutting 5 x 7 paper in quarters, modifying your developer with mercury or glycerine to suit.

I still feel astonishment at the capabilities of the little camera with its fine lens and shutter equipment. Working at F/11, enlargements to 5 diameters can be made that are hard to tell from contact prints, and there is so much in the negatives that they repay working up with diffusion lens, and all the other dodges of the pictorialist. Yet the contact print is by no means too small for the album; and it is certainly the ideal camera for Trail work, whatever we may use at home.

The Trail calls to adventure; it offers every variety of photography—genre, landscape, speed-work. Winter as well as summer it is alluring to those who love the silences of the hills; in the autumn a plate-back and a dozen autochromes will give you results that are worthy of that wonderful process and the hazy noons and chill twilights will make you exult in life.

Try it next vacation!

GILL & SON.

INEXPENSIVE PHOTOGRAPHY

By H. W. HALES

MANY people are deterred from going into photographic pursuits from the mistaken idea that it is an expensive hobby, and that they will not be able to afford the luxury (to them) of a camera. There is a way, however, to have all the pleasures that a camera affords without going to any great expense. It is the object of this short article to give a few ideas to those whose purses may not be over-stocked with cash, and to show that not only may good work be done, but that work of the highest character is frequently done with apparatus of the most extreme simplicity.

It is often said that more depends on the "man behind the gun" than on the gun itself, and so in this case the results are often as good from the simplest and least expensive apparatus as from the most costly. Take landscape photography as an example. What can be more beautiful than the fine soft, and yet almost crisp, definition of a good single landscape lens? Yet the lens is not costly in any way, and in a pinch even a non-achromatic spectacle lens will produce photographs of no mean quality.

So also with cameras—while I am no advocate of cheap goods, and so always advise the worker to obtain the best apparatus he can afford, yet the results so frequently are not indicated by the apparatus used that it often causes one to almost ask why so much money is spent. What is more common, for instance, than to see a man spend one hundred dollars for an anastigmat lens, and then to use it in such a way as to destroy the very effects for which the lens was particularly designed?

Then again, in regard to plates and films, the new worker is often puzzled to know which is best to adopt, and if he decides on plates, what kind of plates and also what size. This is, of course, a question which every intending worker must decide for himself, but long experience has most thoroughly convinced me that the average results obtained by plates are far superior to those of films and, therefore, if economy is an object, by all means use plates at the start.

PURPLE AND WHITE LILACS.

Illustrating article "Inexpensive Photography," by H. W. Hales.

Learn also to give time exposures before learning to make snapshots and carefully study the effects of lights and shadows. Good composition also is a very important factor in obtaining artistic effects, and it is largely owing to its absence that so many snap shots are worthless from a pictorial point of view. For purely landscape work with a small plate camera a single achromatic landscape lens, a good steady tripod, a focusing cloth, and three or six double holders and plates, the beginner not only can obtain a great deal of pleasure, but he will probably lay a permanent foundation for much favorable work. As he gains knowledge of the subject his interest and also the quality of his work will gradually increase and he will not have the many misses and failures that beset so many who begin photography at the wrong end. Not only that but he will find a large saving of cash without any less enjoyment, and it is to call attention to this fact that these few lines have been written.

To sum up, therefore, the writer would say that if you have a taste for photography, by all means indulge in it if possible. It is a hobby which leaves no regrets, and it has opened up almost a new life to many a person who already had artistic ability. The photographs accompanying this article have been made with simple apparatus in order to show what can be done with a single achromatic view lens.

WYOMING VALLEY, PA.

Illustrating article "Inexpensive Photography," by H. W. Hales.

MAJORIE. SOPHIE L. LAUFFER.

GREAT HORNED OWL.

Illustrating article "Bird Hunting With a Camera," by Clarence Bundy.

BIRD HUNTING WITH A CAMERA

By CLARENCE BUNDY

AMONG the varied uses for which we amateurs use our cameras, none is more pleasing or productive of more lasting enjoyment than securing photographs or picturing the home life of those birds making their homes with us all or part of the year. This sport is far ahead of "gunning," requiring more skill and perseverance, imparting an intimate knowledge of birds, besides the added zest of healthful exercise and the satisfaction of having caused no loss of life.

The camera outfit should be at least 4 x 5 in size, with long bellows, and preferably a 5 x 7 lens instead of the regular 4 x 5 as supplied with the camera thus allowing one to secure a large image without approaching so close as to frighten the

WANDERER'S RETURN. Nancy Ford Cones.

bird. For nests, however, the regular 6 in. lens is best, as the longer focal length does not allow one to get close enough.

The best time to secure pictures of the birds themselves is during the incubation and after the nestlings are well grown, as the parents are then bold and daring. By careful focusing a large stop may be used, thus allowing a rapid, fully timed exposure. One thing to be borne in mind is, leave everything about the nest as you found it. If it is necessary to tie back two or three branches in order to secure a better view of the nest, do not fail to restore them to their former places, as neglect to do so may mean desertion by the parents or death

HOME OF THE QUAIL. Figure 1.

to the youngsters from the hot sun. And never, never remove a nest entirely to a different place in order to secure a better light. If you can't get a proper exposure in the place selected by the parent birds, do not take it.

One's enthusiasm should never grow beyond a sensible and human proceeding. I realize this is done.

Two necessary accessories to the bird hunter's outfit is a small hand mirror and a tilting tripod rod. The mirror allows one to reflect light on dark places in the nest or other poorly lighted situations. The tripod top can be used to point the camera downward if necessary, for ground nests, etc., thus giving an effect as the eye sees, which means naturalness.

Unless one is possessed of a good stock of patience, it would be best to choose some other form of photographic work, as one must often wait for a long time—at times hours—for the right condition of weather or for the birds to assume a proper pose; but any one in earnest will forget this when he gets what is wanted. The photo of Mrs. Bob White (Figure 1) was secured just when the youngsters were leaving the shell, and though the lens was within six feet of her beak and I moved freely about in front of her, she never thought of deserting her precious babies.

There is much to be said on this subject that means little to the amateur. Actual experience counts for a great deal more than theory in bird photography, as no hard and fast rules can be laid down to meet every condition; and though experience is said to sometimes be a dear teacher, yet the rewards is this line of work are great, to say nothing of the health-giving open air exercise required.

The knowledge acquired, the different mental attitude towards birds in general, and the lasting pleasure of the pictures secured recommend bird hunting with the camera as a true sport, and one unprofaned by thought of injury to any of our wild creatures.

CATBIRD'S NEST.

Illustrating article "Bird Hunting With a Camera," by Clarence Bundy.

VERMONT FLOWERS C. ERWIN AYERS.

MY EXPERIENCE WITH ENLARGERS AND ENLARGING

By J. E. CARSON

MORE than 20 years ago the enlarging bug bit me, and the poison is still in my system.

My first experience was with a "fixed focus" enlarger, which only worked with one size negative, and was just pointed at the sky, preferably a northern exposure, and some beautiful work was gotten from it, but its scope was so limited that I soon made an enlarger for my 4" x 5" plate camera. This was the most satisfactory enlarger I ever operated, and was the cheapest, as the total cost was around $3.00. A soft pine box, 10" x 10" x 12", was secured. Two electric lamp sockets; 2 60-watt Tungsten lamps; a socket plug and few feet double electric cord; 2 pieces ground glass 8" x 10", and an assortment of screws, completed the outfit that was bought. I had a sheet of *bright* tin 12" x 36", which was used as reflector, being bent into parabolic shape for the purpose. Holes were bored in each end of box, about 3" from bottom, for the lamp sockets; this brought the lamps very near the focus of the parabola, and gave excellent illumination. White cardboard was also used and seemed to be quite as good as the tin. The two pieces of ground glass were placed 8" and 9", respectively, from the bottom of the box. One end of box and the top frame were screwed on. Camera was attached to its frame, and the enlarger was ready for business, when coupled to an electric socket. The results from this enlarger approached nearer the daylight quality than any other I ever operated; hence this lengthy description.

No. 3 was a stock machine, using the diffusion principle; it was equipped with extension bellows and bed, easel and easel frame. The housing was of metal, and it was electrically operated. Having doubled the bellows extension, lantern slides could be made from 4" x 5" and 5" x 7" negatives. This was a fine outfit, but could not be used for D. O. P. enlargements, which was the only objection to it. Some vandal ruined it, after stealing most of its fittings.

THE CULVERT. WARREN R. LAITY.

No. 4 was a projecting machine, with 4″ condensers, which made it useless for anything but the smaller negatives. It was electrically operated, having carbon fingers, which produced an arc of great brilliancy, making the machine too fast for anything but D. O. P., and not allowing sufficient time for "doctoring" it. This did not suit me, for I cannot make negatives that will stand any such treatment. My experience with this machine was meagre. I regret this, for am sure there were wonderful possibilities in the machine; especially would this be so at this time, when V. P's are so popular, for the small negatives could have been handled without trouble.

This brings me to my present enlarger, which is an "Ingento", with 6½″ condensers, electrically operated. For bromides, a 60-watt Mazda with frosted globe is used. For carbon black, a 250-watt Nitrogen Mazda, with clear globe, ground glass being used between it and the condensers. For satisfactory work on D. O. P., a Nitrogen Mazda of about 500 watts should give good results, in a reasonable time. This machine should suit the most fastidious. It has fewer faults and fewer limitations than any enlarger I have ever operated. An F-4.5 convertible anastigmat, of 7″ equivalent focus, is used for a projecting lens, generally wide open. One thickness of cheese cloth is placed over the lens, for diffused effects.

Have had no experience with the Mercury Vapor "M" Tubes, but imagine they approach daylight closer than any artificial light.

Am convinced that a low voltage, high amperage locomotive headlight lamp would give superior results, used in any enlarger.

My experience with condensers leads me to believe that they do better work used with ample diffusion, which can be accomplished by placing a ground glass between light and condensers, very close to the latter. This almost eliminates granularity and small defects, such as pin holes and scratches, and softens the general effect. A frosted, or ground glass lamp globe is an aid to this. When you lessen the effects of negative imperfections, by diffusion, you are adding to the pleasure of enlarging, and removing one of its objectionable features. The ground glass *between* the condensers is not nearly so efficient. Try it.

Let it be understood that I am not posing as an authority in

EDWARD B. WESTON, M.D.

EDWARD WESTON.

this matter; am simply an enthusiast, seeking more light, and trying to pass on to other seekers things that I observe, that they may eliminate some of the difficulties, and profit by my experience.

Enlarging is a fascinating pastime, that is bound to become more popular, for the small camera has come to stay, and it needs the enlarger to increase its usefulness and value. One does not have to use the expensive enlarger, for any handy man can make one which will give as good results as the other, and have the added pleasure of turning out work by means of his own handiwork. There is nothing better than an enlarger similar to the one I built. Get this fact into your mind, that, it is yourself, not the machine, that is the real factor in this work. Know your outfit, its capacity and its limitations, and then get out the best there is in it.

My photo work is confined almost entirely to making 1½" x 2½" pictures, and enlarging them to 4" x 6". This requires a bellows extension of about 9" to 10", and the easel from 30" to 40" from lens board. The exposures vary from 1 to 15 seconds, on P. M. C. bromide, using the 60-watt, frosted Mazda, without other diffusion. The secret of successful and satisfactory enlarging is plenty of properly diffused light, regardless of its source.

When using condensers, it is very important to have the center of light on axis of the condensers, and to have the light placed just where it should be. This can always be ascertained by removing negative and carrier, after having focused your picture on the easel, and then throwing the light upon the easel through unobstructed lenses. When the light circle is evenly distributed, and of same intensity over the easel, the source of light is correctly placed, and you are ready to proceed. It is wise to re-focus through the negative, before proceeding. Whenever you change from one size enlargement to another, this process should be gone through with, for each change calls for change in position of the light. Condensers give better results, when no diffusion is used, with a very concentrated source of light.

Another phase of enlarging, is to make a negative of the enlargement. Plates, films or paper may be used for this. I prefer a smooth paper for the enlargement, for I can "doctor" it,

THEODORE EITEL.

and then make a copy on plate or film. Where you have many prints to make from same negative, or a valuable picture that you wish to preserve in a larger form, this process solves the problem. A skilful worker, with stomp, brush and pencil, can work wonders with an enlargement, from a defective negative. Any good plate may be used in copying, but the Orthos, Panchros and Portrait Film should give the better result. It is very important to have the enlargement evenly lighted, and the lens well shaded, when copying; for it is easy to go wrong.

Enlarging is one of many photographic arts that is well worth while, and will handsomely repay for time and attention bestowed upon it. Like all other things photographic, it requires cleanliness, system and use of brains.

A YOSEMITE TRAIL. CARL KATTELMANN.

ONCE CLOISTERS:
NOW CRUMBLING RUINS.

EDGAR A. COHEN.

B. F. LANGLAND.

USING A RAY FILTER FOR ENLARGING

JOHN BOYD

THERE are times when we get a thin negative that is full of detail, and which we wish to enlarge. To do so in the usual way means a flat muddy print which no one wishes to look at.

Some time ago I was looking at some negatives of this sort and was going to prepare an intensifying solution, when it flashed across my mind to try an exposure through one of my filters. I made a trial print in accordance with the factor of that particular filter. The result was beyond expectations.

Further experiments along the lines of increasing or decreasing the exposure, taught me that practically any kind of results are possible.

Any filter that increases the exposure from 3 to 30 times will do, but naturally the denser kinds will give the stronger prints.

This method will save workers much bother, and as I have used it for some time, and made many enlargements by it, I offer it to the fraternity as an aid to better work.

BEAUTIFUL EYES. JARED GARDNER.

HAND OR STAND

By J. E. ADNAMS

OF the thousands of people who make a hobby of photography it is safe to say that the vast majority of them start their first acquaintance with the art by using a hand camera. It is perhaps natural for them to think that as the hand camera was invented long after the stand that it is an improvement on it, and intended to supersede it.

This is by no means the case as each form of instrument has its own place and its own limitations. For hasty snapshots of street scenes, races, hurdle jumping, and such like subjects, the hand camera has all its own way, but for serious and deliberate pictorial work there are many advantages gained by using a stand camera. Good pictorial work is often done by the hand camera, as we know, but it is difficult and takes a cleverer man to do it.

Fortunately there are many good "hand and stand" cameras to be had which combine the advantages of both kinds. In pictorial work which can be done deliberately and carefully, such as landscape or architecture, it is best to use the instrument as a stand camera, viewing and focusing the subject on the ground glass.

There are many reasons for this. First there is getting the exact amount of subject on the plate. The small brilliant finder *may* be quite correct, but it is only so when the eye is exactly opposite the central point. Looking at the finder even slightly from an angle gives a wrong view, and it may turn out that an important piece is cut off and something unnecessary included. On the ground glass we see the exact amount which will come on the plate. Sometimes in taking a landscape a straggling branch will project into the picture and spoil it. This is perhaps unnoticeable in the small finder, but can easily be seen on the ground glass. Or the horizon line in a seascape may come out sloping when using a hand camera, owing to the difficulty

NORMAN DOORWAY.
ADEL CHURCH, YORKSHIRE.

J. F. ADNAMS.

of keeping the eye both on the finder and the level at the same time.

Pictorial effect is often better when one plane is in sharp focus and the remainder a little out. If we are using a stand camera we can try this selective focusing until we see just what we want to get, but if it is a hand camera there is the difficulty of judging distances, and the impossibility of seeing whether we have the desired result or not.

It is well known that there is a danger in using a hand camera to photograph a lofty tower or other building, of not keeping the camera level and so getting the vertical lines converging upwards. This is not so likely with the stand camera, as we see at once if the lines are converging and can correct them.

When taking a landscape sometimes we judge that it would be greatly improved if a figure could be got at a certain spot so as to take off some bareness, or introduce a pleasing balance of effect. We wait for the figure to come along, some passing pedestrian or bicyclist, a few cows or sheep or what not. With the stand camera we have everything focused and arranged and can give our undivided attention to placing the figure when it turns up, but with a hand camera we have to watch for the figure and at the same time see to keeping the camera level and pointed to the subject properly. We perhaps get confused and either snap the shutter a little too soon, or too late, and so get the figure in the wrong place.

Some people are much troubled by the idea of the picture being upside down on the ground-glass screen, that is a detail which you get used to in a little while and it does not trouble you at all. Others object to the apparatus being less portable than the hand camera, but if one can get better results, a little more weight in carrying is of no consequence whatever.

ELLIOTT STUDIO.

American Annual Formulary

In the following section we have gathered together a typical collection of Formulae and Tables, which will assist the photographer in his every-day work. It will be noticed that makers' formulae are omitted. These can best be obtained by direct application to the makers. The appended formulae are selected from the working methods of practical photographers.—Editor.

TRADE DEVELOPERS FOR PLATES AND PAPERS

Amidol. A concentrated developer for plates.—Water, 13 ounces; sulphite of soda (anhydrous), 1¼ ounces; when dissolved add amidol, ¼ ounce. The solution keeps fairly well in bottle completely full and well corked. For use take 1 ounce of the concentrated solution and dilute with 3 or 4 ounces of water.

Amidol. For gaslight papers.—An excellent developer for those subject to metol poisoning. (V. Serin.) Amidol, 60 grains; sulphite of soda (anhydrous), 325 grains; potassium bromide, 10 grains; water, 20 ounces. Will keep only three or four days. Time of development about ½ minute.

Diamidophenol. For Paper (Edwin Loker.)—Water, 20 ounces; sodium sulphite (anhydrous), 1½ ounces; sodium bisulphite, 10 drams; bromide potassium, 10 grains. To use, take 2 ounces and add 6 grains diamidophenol.

Ferrous Oxalate. For Papers (M. G. Lovelace).—No. 1. Hot water, 1000 CC. Dissolve ferrous sulphate, 250 grams; add slowly sulphuric acid, 3 CC. No. 2. Potassium oxalate (neutral), 250 grams; potassium bromide, 1 gram; hot water to make 1000 CC. Add 1 part of No. 1 to 4 parts of No. 2. After development wash in acetic acid stop bath.

Hydrochinon. (M. G. Lovelace).—Water, 850 CC.; hydrochinon, 6.5 grains; sulphite soda (anhydrous), 30 grains; carbonate soda (dry), 100 grains; potassium bromide (saturated solution), 20 to 30 drops.

Hydrochinon.—For over-exposure plates to obtain contrasty negatives (B. H. Allbee).—No. 1, water, 8 ounces; sulphite of soda (anhydrous), ½ ounce; hydrochinon, 80 grains. No. 2, water, 8 ounces; carbonate of soda (dry), 1 ounce; potassium bromide, 40 grains. Take equal parts of No. 1 and No. 2. Temperature, 70 degrees.

Metol (H. W. Hales).—Metol, 60 grains; warm water, 16 ounces; sulphite of soda (anhydrous), ½ ounce; carbonate of soda (dry), ½ ounce. Dissolve metol in warm water, then add the sulphite and carbonate in order named. Cool. Can be used repeatedly. For developing papers add a few drops of 10 per cent. solution of bromide of potassium.

Metol-Hydroquinone for Orthochromatic Plates.—Water, 20 ounces; metol, 14 grains; potassium metabisulphite, 18 grains; hydroquinone, 56 grains; sulphide of soda (anhydrous), 1 ounce; carbonate of soda (dry), 1¾ ounces. Use 1 drop of a 10 per cent. potassium bromide solution to each ounce only if necessary.

Metol-Hydroquinone. For Paper (M. Gartner).—Water, distilled 32 ounces; metol, 15 grains; sulphite of soda (anhydrous) 1 ounce; hydroquinone, 60 grains; sodium carbonate (dry) 6 drams (for contrast use 1 ounce); bromide of potassium, 5 grains. Dilute this stock solution with an equal amount of water.

Para-Amidophenol. (M. G. Lovelace).—Dissolve 150 grains sulphite soda (anhydrous) in 800 CC. hot water; add 20 grains para-amidophenol; dissolve 8 grains lithium hydrate in 100 CC. water, and add until precipitate formed is dissolved; then add water to make 1000 CC.

Paramidophenol-Hydrochloride (S. Wein).—Paramidophenol-hydrochloride, 48 grains; carbonate soda (dry), 1 ounce; sulphite soda (anhydrous), 1 ounce; water, 20 ounces. For use, dilute with equal quantity of water.

Pyro. For Prints (M. G. Lovelace).—No. 1 Pyro, 12 grains; sulphite soda (anhydrous), 80 grams; potassium ferrocyanide, 2 grams; water, 500 CC. No. 2 Sodium hydrate, 4 grams; water, 500 CC. To use, one part each with water 2 parts. Add 3 drops saturated solution bromide of potassium to every 400 CC. of developer.

Pyro. For Night Subjects (Robert Dykes.)—Stock solution—Pyro, 1 ounce; potassium bromide, 60 grains; potassium meta-bisulphite, 50 grains; distilled water to make 12 ounces. No. 1. Take stock solution 3 ounces, add 2 ounces boiled water. No. 2. Sulphite soda (anhydrous), 1 ounce; carbonate soda (dry), 1 ounce; water (boiled) to make 20 ounces. For use, 4 drams No. 1 to 5 drams No. 2 in 16 ounces of water.

Pyro. For Overtimed Plates (J. D. Elliott).—Sulphite soda, 40° solution, 4 ounces; water, 4 ounces; pyro, 10 grains. Immerse plates in this solution for 20 minutes in the dark; then add to above solution ½ drachm carbonate soda, 20° solution. When image appears add one more drachm of the carbonate soda solution.

Pyro. For Plates (J. D. Elliott).—Sulphite soda, 40° solution, 4 ounces; carbonate soda, 20° solution, 4 ounces; pyro, 10 grains.

Pyro-Metol. For plates (H. M. Long).—A. Water, 22½ ounces; metabisulphite, 2 dram; metol, 60 grains; pyro, 1 ounce. B. Water, 16 ounces; sulphite soda (anhydrous), 2 ounces. C. Water, 16 ounces; carbonate soda (dry), 1 ounce. Normally used 1 ounce of each stock to 16 of water.

Pyro Soda. For Plates (Mellen).—No. 1. Water, 20 ounces; sulphite soda (anhydrous), 2 ounces; carbonate soda (dry), 2 ounces. Dissolve the sulphite first and then add the carbonate. No. 2. Water, 6 ounces; pyro, 1 ounce. For correct exposure take 1 dram of No. 2; 1 ounce of No. 1, and add 2 ounces of water. For snapshots or plates thought to be under-exposed, use 1 dram of No. 2, 1½ drams of No. 1, and 6 ounces of water. For over-exposure take 2 drams of No. 2, 1 ounce of No. 1 and 6 ounces of water. Or, instead of the 2 drams of No. 2 in this solution use 1 dram of No. 2 and 10 drops of a 10 per cent. solution of potassium bromide.

TANK DEVELOPERS FOR NEGATIVES

Metol-Hydro (Frew).—Water, 12 ounces; metol, 7½ grains; sulphite soda (anhydrous), 274 grains; hydroquinone, 30 grains; carbonate soda (anhydrous), 150 grains; bromide potassium, 2 grains. For use to each ounce of above add 4 ounces of water; temperature, 65 degrees; time, 12 minutes.

Monomet-Hydro-Pyro (John Boyd).—Monomet, 4 grains; hydroquinone, 4 grains; pyro, 4 grains; metabisulphite potassium, 4 grains; carbonate of soda, dessicated, 40 grains; sulphite of soda (anhydrous), 60 grains; bromide of potassium, 1 grain; water, 4 ounces. For tank development use 28 ounces of water. Development 20 minutes at 65 degrees.

Pyro (George D. Jopson).—No. 1. Water, 16 ounces; meta-bisulphite of potash, 70 grains; pyro, 1 ounce; bromide potassium, 8 grains. Mix in order given. No. 2. Sulphite soda, 60° test. No. 3. Carbonate soda, 40° test. To use, mix 2½ ounces of No. 1, 2 and 3 in rotation, add 57 ounces of water. Develop 20 minutes at 65°.

Rodinal or Azol.—Water, 60 ounces; rodinal or azol, 1 ounce; temperature, 65 degrees; time, 25 minutes.

DEVELOPERS FOR LANTERN SLIDES

Hydroquinone (B. H. Allbee).—No. 1. Hydroquinone, 150 grains; metabisulphite potash, 10 grains; bromide potassium, 50 grains; water, 20 ounces. No. 2. Sulphite of soda (anhydrous), 1 ounce; caustic soda, 100 grains; water, 20 ounces. Take equal parts of No. 1 and No. 2.

Hydroquinone. One Solution for Warm Tones (A. H. Farrow). Hydroquinone, 1 dram; sulphite of soda (anhydrous), 2 drams; carbonate of soda (dry), 4 drams; bromide of potassium, 20 grains; water, 12 ounces.

Hydroquinone. For Colder Tones (B. H. Allbee).—No. 1. Hydroquinone, 60 grains; sulphite of soda (anhydrous), 1 ounce; citric acid, 10 grains; bromide potassium, 10 grains; water, 10 ounces. No. 2. Carbonate of soda (dry), 1 ounce; water, 10 ounces. Use equal parts.

FIXING BATHS AND HARDENERS

Acid Fixing Bath (Carbutt).—Sulphuric acid, 1 dram; sodium hyposulphite, 16 ounces; sulphite of soda (anhydrous), 2 ounces; chrome alum, 1 ounce; warm water, 64 ounces. To prepare the bath, dissolve the hypo in 48 ounces of water, the sulphite of soda in 6 ounces; mix the sulphuric acid with 2 ounces of the water and pour slowly into the sulphite solution and then add to the hypo solution. Dissolve the chrome alum in 8 ounces of water; add to the bulk of the solution and the bath is ready for use.

Fixing Bath for Lantern Slides (B. H. Allbee).—Sulphuric acid, 1 dram; hypo, 16 ounces; sulphite of soda (anhydrous), 1 ounce; chrome alum, 1 ounce; water, 64 ounces.

Plain Fixing Bath.—Dissolve 1 pound of sodium hyposulphite in 2 quarts of water, or 4 ounces of the hypo in a pint of water, according to the bulk of the solution required.

Hardener for Fixing Bath (Beach).—Water, 40 ounces; sulphite of soda (anhydrous), 3 ounces; powdered alum, 16 ounces; acetic acid, 40 ounces. Add in the order given and shake well until dissolved. Of the above add 16 ounces to each gallon of hyposulphite of soda solution, testing 70 to 80 degrees.

Hardening Negatives.—Immerse them for a few minutes in formalin, 1 ounce; water, 30 ounces.

INTENSIFICATION

Intensifier, One Solution (F. M. Steadman).—No. 1. Bichloride of mercury, ½ ounce; water, 10 ounces. No. 2. Iodide of potassium, 5 drams; water, 1½ ounces. Add to No. 1. No. 3. Hyposulphite of soda, 1 ounce; water, 2½ ounces. Add to the previous mixture. This clears the solution when it is ready for use for local intensification. For tray intensification add more water to slow its action.

Intensifying with Red Ink (E. M. Cohen).—Soak the negative well. Put teaspoon of red ink into tray of water and rock until mixed.

Immerse negatives face up till well and evenly colored, then without washing put in drying frame. If left in solution too long will be over dense, in which case several trays of clear water will eliminate some of the color.

The intensification is permanent without the danger of negative going bad, as is the case when mercury is used.

Intensifier—Mercuric Chloride Process.—No. 1. Mercuric chloride, 200 grains; bromide of potassium, 120 grains; water, 6½ ounces. No. 2. Sulphite of soda (anhydrous), 1 ounce; water, 4 ounces. The well-washed negative, free from hypo, must be thoroughly bleached in No. 1; well washed; and then blackened in No. 2. After blackening it is well washed again.

REDUCTION

Reducer, Single Solution (F. M. Steadman).—Red prussiate of potash, size of pea; hyposulphite of soda, six times that volume; water, 6 ounces (for local reduction, 1½ ounces.) When reduced wash thoroughly.

Reducer—Ammonium Persulphate.—Ammonium persulphate, 15 grains; water, 1 ounce. The solution should be made just before use. The negative must be perfectly free from hypo or it will be stained by the persulphate. When the desired reduction has been reached, transfer the negative without washing to a 10 per cent. solution of anhydrous sodium sulphite. Wash finally for 15 or 20 minutes.

Reducer—Farmer's.—Dissolve 1 ounce of potassium ferricyanide in 9 ounces of water and make up to 10 ounces, forming a 10 per cent. solution. Label this poison. Thoroughly wet the negative to be reduced. Take enough fresh plain hypo fixing bath for the purpose, and add to it enough of the ferricyanide solution to make it a light straw color. The negative to be reduced is immersed in this solution, when it will be seen to lose density. Rock the tray to insure evenness of action. This reducer can also be used for local treatment.

PRINTING PROCESSES

Blue Prints

Blue Printing Sensitizing Formulæ (Brown).—A. Dissolve 110 grains ferric ammonium citrate (green) in 1 ounce of water. B. Dissolve 40 grains of potassium ferricyanide in 1 ounce of water. These two solutions are made up separately. They are then mixed together and kept in a stoneware bottle, but the single solution should always be filtered before use. The mixture will retain its good qualities for months if kept from the light.

(Millen).—Potassium ferricyanide, 1 ounce; ammonic citrate of iron, 1½ ounces; distilled water, 10 ounces. Mix thoroughly and filter. The solution should have a deep wine color and dry on the paper a lemon-yellow. If the solution is green and has a precipitate, the ammonio-citrate is old and spoiled. The mixture should be kept from the light.

Bromide Paper

Bromide Paper Developers: Hydroquinone-metol. No. 1. Water, 10 ounces; hydroquinone, 52 grains; potassium metabisulphite, 18 grains; sulphite of soda (anhydrous), 5 drams; carbonate of soda, 1¼ ounces. No. 2. Water, 10 ounces; metol, 30 grains; carbonate of soda, 5 drams; sulphite of soda (anhydrous), 5 drams. One or two drops of a potassium bromide 10 per cent. solution added to 1 ounce of the mixed developer will increase contrast and keep the whites pure. Equal parts of 1 and 2 give excellent prints from a normal negative; one part of 1 and two of 2 give gray prints with maximum half-tone and gradation; two parts of 1 and one of 2 give vigorous prints from soft delicate negatives.

Amidol for rich blacks (freshly prepared). Distilled (or boiled) water, 4 ounces; sulphite of soda (anhydrous), 45 grains; amidol, 10 to 15 grains. Add a drop of 10 per cent. bromide solution to each ounce of developer.

Sepia Tones: Hypo Alum.—Hyposulphite of soda, 5 ounces; ground alum, 1 ounce; boiling water, 70 ounces. Dissolve the hypo in the water, and then add the alum slowly. A milk-white solution results which should be decanted when clear. It is not used until cold (about 60° Fahr.).

Sepia Tones: Sulphide of Sodium.—The fixed and washed print is treated with one of the following solutions: (1) Potassium ferricyanide, 10 grains; potassium bromide, 10 grains; water, 1 ounce; or (2) potassium ferricyanide, 20 grains; sodium chloride (common salt), 30 grains; water, 1 ounce. The image will be bleached by either of these solutions in a few minutes, the whitish appearance of the deposit being caused by its change into a salt of silver. After 5 minutes in running water apply the sulphuretting solution: Dissolve 3 ounces of sodium monosulphide in 15 ounces of water; boil the solution for about 10 minutes, filter off the black precipitate formed, and when cooled make up to 25 ounces with water. To tone take of the sulphide solution 1 ounce and add water 12 to 20 ounces.

Red Tones: Copper.—Dissolve 100 grains of ammonium carbonate in 2 ounces of water, and in this solution dissolve 10 grains of sulphate of copper. Then add 20 grains of potassium ferricyanide. A clear, dark green solution results which gives a red-chalk tone in about 3 minutes. Tone until the deepest shadow is converted, and then wash the print for 10 minutes.

Green Tones: Vanadium.—Bleach print in the following: Potassium ferricyanide, 10 grains; ammonium carbonate, 100 grains; water, 1 ounce. Wash well and apply: Ferric chloride, 2 grains; vanadium chloride, 2 grains; ammonium chloride, 4 grains; hydrochloric acid, 5 minims; water, 1 ounce.

Blue Tones: Iron.—Bleach print in: Potassium ferricyanide, 10 grains; ammonium carbonate, 100 grains; water, 1 ounce; then tone in ferric chloride, 5 grains; hydrochloric acid, 5 minims; water, 1 ounce.

To prevent blistering on bromide paper (P. L. Anderson).—Immerse after fixing and before washing from 10 to 15 minutes in water, 10 ounces; formaldehyde, 1 ounce. A 10 per cent. solution of chrome alum will do equally well.

To make bromide paper translucent (P. L. Anderson).—Lay the paper negative face down on a blotter and paint thinly with the following mixture. Give three coats. Turpentine, 3 ounces; powered resin, 1 ounce; gum elemi, 1 ounce; paraffine wax, ½ ounce. Heat with stirring until it begins to boil. Allow to cool slightly and add turpentine, 3 ounces.

Carbon Tissue

Carbon Tissue, Sensitizer for (Bennett).—Potassium bichromate, 4 drams; citric acid, 1 dram; strong ammonia water, about 3 drams; water, 25 ounces; dissolve the bichromate and citric acid in hot water, and add sufficient ammonia to change the orange color of the solution to lemon-yellow. Sensitize for 90 seconds; reducing the water softens the gradation in the print; increasing it to 30 ounces gives more vigor.

Carbon Lantern Slides.—Prepare the glass by coating with the following preparation: 180 grains of Nelson's Gelatine No. 1, in 20 ounces water. Add 10 grains bichromate of potash. Dry and allow the plate to be exposed to light for a couple of days to make the coating thoroughly insoluble. Sensitizer for tissue: 1 per cent. to 1¼ per cent. solution of bichromate of potash. Immerse 2 minutes. Print deeply; expose twice as long as ordinary paper print. Develop in hot water as usual.

Gum Bichromate

Gum Bichromate (Casper Millar). A.—Gum arabic, 1¼ ounces; water, 3½ ounces; salicylic acid, 4 grains.

B.—Chrome alum, 45 grains; water, 3½ ounces. Grind A and B with water and pigment, brush over paper, dry and store.

Suggested formula.—A. 2 ounces; B, 1½ drams; carbon black, 10 grains; sensitize for 2 minutes in 5 per cent. bichromate solution.

Kallitype

Kallitype Sensitizer for Black Tones (J. Thomson).—Distilled water, 1 ounce; ferric oxalate (Merck's or Mallinckrodt's), 15 grains; citrate of iron and ammonia (brown scales), 25 grains; chloride of copper, 8 grains; oxalate of potassium, 35 grains; oxalic acid, 15 grains; silver nitrate, 15 grains; gum arabic, 10 grains. For greater contrast add 1 to 10 drops 5 per cent. bichromate of potassium solution.

Developer: Stock Solution.—Distilled water, 1 ounce; silver nitrate, 40 grains; citric acid, 10 grains; oxalic acid, 10 grains. Filter. Normal developer 1 dram stock solution and 7 drams of water.

Platinum Papers

Platinum Sensitizer (P. L. Anderson).—Stock solutions: I. Water, hot, distilled, 2 ounces; ferric oxalate, 240 grains; oxalic acid, 16 grains. II. Water, hot, distilled, 2 ounces; ferric oxalate, 240 grains; oxalic acid, 16 grains; potassium chlorate, 4 grains. III. Water, distilled, 19 drams; potassium chloroplatinite, 219 grains (=½ ounce). Keep in amber glass bottles or in the dark. For use take: I, 22 mm.; II, 0 mm.; III, 24 mm. Gives very soft prints. Or, I, 12 mm.; II, 10 mm.; III, 24 mm. Results about the same contrast as a P. O. P. print Or, I, 0 mm.; II, 22 mm.; III, 24 mm. Gives extreme contrast.

Above quantities sufficient for a 10 x 12 sheet of ordinary paper. Very smooth requires less and very rough more, up to 25 per cent. additional. Apply with a soft fitch or camel-hair brush, allow to surface dry, and make bone-dry over a stove or gas jet. Should dry in not less than five or more than ten minutes.

Platinum: Sensitizing Gold Bath and Sepia Papers. A.—Chloroplatinite of potassium, 15 grains; distilled water, 90 minims.

B.—Ferric oxalate, 21 grains; oxalic acid, 2 grains; distilled water, 183 minims. For cold bath paper, mix A and B, and add 15 minims of water. For sepia paper mix A and B and add 15 minims of a 5 per cent. solution of mercuric chloride. The addition of a few grains of potassium chlorate to any of the above gives increased contrast in the print. From 140 to 170 minims of solution are sufficient to coat a sheet of paper 20 x 26 inches.

Platinum Prints: to Intensify. A.—Sodium formate, 45 grains; water, 1 ounce.

B.—Platinum perchloride, 10 grains; water, 1 ounce.

C.—For use, take 15 minims each of A and B to 2 ounces of water. Immerse prints until sufficiently intensified, then remove and wash.

Platinum Prints to Distinguish from Bromide.—Soak the print in saturated solution of mercuric chloride; a platinum print will not change; a bromide print will bleach.

Salted Papers

Salted Paper Prints: Sensitized with the following: Silver, 480 grains Troy; water, 11 ounces. Dissolve and pour off 2 ounces, and to the 9 ounces left add strong aqua ammonia to form a precipitate and redissolve the precipitate, then add the remaining 2 ounces which will form another precipitate; to this add 9 drops of nitric acid C. P. Apply this to the paper with a tuft of cotton.

Any good toning bath will give good results, such as—Chloride aluminum, 80 grains; bi-carbonate soda, 360 grains; water, 48 ounces. When mixed this will form a flaky hydrate which will settle to the bottom. It can be strained through clean washed muslin. To prepare a small bath for toning, take 12 ounces of the stock solution and add sufficient gold to tone in 8 to 10 minutes. The gold solution must be neutralized with bi-carbonate soda before adding to the above bath. When the prints reach the desired tone throw them into a bath of salt water, made of water, 1 gallon; table salt, 1 ounce.

Printing Out Papers

Gold Toning (B. H. Allbee).—No. 1, 10 per cent. solution sulphocyanide of potassium; No. 2, 15 grains chloride of gold in 7½ ounces of water; No. 3, 10 per cent. solution phosphate of soda; No. 4, saturated solution borax. Take No. 1, 1 dram, water, 8 drams; No. 2, 4 drams; No. 3, 1 dram; No. 4, 2 drams. In this put print in dry. Toning should be complete in two minutes. Wash as usual.

Gold Toning.—For blue-black tones, for slight strengthening, and for converting rusty black into pure black. Soak prints in warm water, lay on warm glass, brush over glycerine and blot off. Pour on few minims of solution of gold chloride (1 grain per dram), and rapidly brush in all directions. When toned, rinse, and sponge back and front with: Metol, 50 grains; sodium sulphite, 1 ounce; potassium carbonate, ½ ounce; water, 20 ounces. Tone in daylight. Do not tone sepias or old prints in this solution.

Gold Toning—To Give Black Tones (A. B. Klugh).—Solution A. Sodium thiosulphate (hypo), 40 grams; water, 100 cc. Solution B. Lead nitrate, 5 grams; acetic acid, glacial, 5 cc.; water, 50 cc. Add to solution A enough of B to produce a slight milkiness. Filter and add 25 cc. of a 1% solution of gold chloride. Print deeply and tone until a warm black is produced.

MISCELLANÆ

Adhesive for Labels.—Soak 1 part of the best glue in water until thoroughly swollen, add a little sugar candy, 1 part of gum arabic and 6 parts of water. Boil with constant stirring over a spirit lamp until the whole gets thin. Coat sheets of paper with it; let dry and cut up into convenient sizes.

Autochromes.—Sensitizing to get more speed (M. G. Lovelace).—In complete darkness bathe plates in the following solution: Distilled water, 66 cc.; ethyl alcohol, pure, 90 deg., 33 cc.; dye solution, 2 cc.; ammonia, .30 cc. The dye solution is a mixture of pinachrome, pina verdol and pinacyanol, 1 part of each in 1000 of alcohol. Bathe plates for five minutes and dry away from dust. These plates require a special filter the formula being: Hard gelatine, 3 gms.; distilled water, 100 cc.; filter yellow K, 1 per cent. solution, 2.5 cc. Use 1 cc. to each 10 square centimeters of surface. These plates have about five times the speed and it is possible to make snap shots with them if a lens working at F/4.5 and F/5.6 is used.

Blackening Mixture.—Dissolve a 4-ounce stick of licorice in 8 ounces of water with the aid of gentle heat. When dissolved rub into the mixture 1 ounce of burnt sienna in powder, using the back of a spoon for this purpose. When cold, bottle for use.

Blackening Brass.—Make two solutions: Copper nitrate, 200 grains; water, 1 ounce. Silver nitrate, 200 grains; water, 1 ounce. Mix the solutions; clean the article well; dip it in the solution for a moment; withdraw it; dry it; and heat it strongly.

Black, Dead, for Wood.—Shellac, 40 parts; borax, 20 parts; glycerine, 20 parts; water, 500 parts. When dissolved, add 50 parts aniline black.

Cleaning Greasy Bottles.—Wash with benzine, or permanganate of potassium, to which has been added some hydrochloric acid.

Bottles that have contained resinous substances, wash with potash or soda and rinse with alcohol. Bottles that have contained essences, wash with sulphuric acid, then with water.

Clearing Stained Negatives.—Dissolve 1/8 ounce of pulverized alum in 20 ounces of water and add 1 dram of sulphuric acid. Immerse the stained plate in this solution for a few minutes; remove plate, wash and then set in the rack to dry.

Film: to Remove from Glass: Make two solutions. A.—Sodium flouride, 6 grains; water, 4 ounces.

B.—Sulphuric acid, 6 drops; water, 1 ounce. Place the negative in solution A for 2 minutes and then place directly in solution B. After another 2 minutes lift the film with the finger from one corner of the plate. It will soon leave the glass.

Firelight Effects on Developing Paper (H. S. Hood). No. 1.—Water, 5 drams; copper sulphate, 10 per cent. solution, 15 minims; ammonium carbonate, 10 per cent. solution. Add till precipitate first formed is re-dissolved.

No. 2.—Water, 4½ ounces; potassium ferricyanide, 6/10 drams. Mix separately and add No. 2 to No. 1. The print will turn bright red Wash well.

Ground Glass: Substitutes for. 1.—Paraffine wax makes an excellent substitute for ground glass if the latter should get broken. Iron the paper onto a sheet of plain glass. It is more transparent than the focusing screen and the image will appear clearer; hence, in exposing allowance must be made for the difference in illumination.

2.—Resin dissolved in wood alcohol and blown over the glass; this must not be scratched; it gives a very fine-grained ground glass effect.

3.—White wax, 120 grains; ether, 1 ounce.

Ground Glass Varnish: Sandarac, 90 grains; mastic, 20 grains; ether, 2 ounces. Dissolve the resins in the ether and add benzole ½ to 1½ ounces.

Lens: to Clean.—The lens should always be kept free from dust or other impurities. To clean it, spread upon a table a clean sheet of paper; take the lens apart, and with a camel-hair brush dust each of the combinations on both sides. If the surfaces of the lenses are very dirty and have lost their polish, make up the following: Nitric acid, 3 drops; alcohol, 1 ounce; distilled water, 2 ounces. Dip a tuft of filtering cotton in this solution, rub each side of the lens, then polish with an absolutely clean chamois. Clean the lens tube before replacing the lenses, each of which should be finally dusted with a camel-hair brush.

Moonlight Effects on Developing Paper (H. S. Hood).—Immerse in water, 5 ounces; ferric ammonium citrate, 12 grains; potassium ferricyanide, 12 grains; nitric acid, 2/5 drams. Prints will assume a blue color. Wash until whites become clear.

Mounting Without Cockling (W. S. Davis).—Coat back of dry print with as strong a solution of warm gelatine (pure table gelatine will do) as can be spread easily. Allow to dry, then attach to mount by dampening the amount with water, then lay print in desired position; cover with a sheet of bond or smooth paper, and apply a warm flat iron until the gelatine melts. Very effective for thin mounting material, as there is no cockling if the mount contains just the right amount of water.

Non-Abrasion Soda Mixture (M. G. Lovelace).—Sulphite of soda (anhydrous), 1 ounce; carbonate of soda (dry), 370 grains; hypo, 8 grains. A mixture in these proportions may be used in place of sodas for paper; or carbonate of soda (dry), 28.75 grams; hypo, 38.75 grams; water to 500.00 c.c.

Paste, Starch (A. Lomax).—Powdered starch, 1 ounce; cold water, 12 ounces. Mix smooth with a glass rod, heat to boiling point. Boil half a minute stirring all the time. Use cold.

Poisons and Antidotes.—Administer the antidote as soon as possible. If a strong acid or alkali, or cyanide of potassium, has been swallowed, lukewarm water in large quantities should be swallowed at once. Where strong acids or alkalies have not been swallowed, rid the stomach of the poison by vomiting; for this purpose take 25 grains of zinc sulphate in warm water.

Polished surfaces: to Photograph.—Smear the surface with soft putty so as to deaden the reflections. Photograph the article against a black background, and stop off all reflections, allowing the light to come from one direction only. To photograph hollow cut glassware fill with ink or aniline black water dye. Before photographing machinery deaden the bright parts with putty.

Safe Light for Panchromatic Plates.—Take old dry plates and coat with the following: Water, 10 ounces, tartrazine, 75 grains; patent blue A, 75 grains; naphthol greens, 75 grains; sulphuric acid, 30 minims. Stain the plates as deeply as possible. Use two plates.

Stains: to Remove from the Hands.—Developer stains: solution of citric or oxalic acid. Silver nitrate stains: Water, 4 ounces; chloride of lime, 350 grains; sulphate of soda, 1 ounce. Apply with a brush.

Tarnished Daguerreotypes, to Restore.—Remove the silvered plate from the case and place it, image uppermost, under a box lid or other protector from dust, etc. Put a small piece of potassium cyanide into a graduate and pour over it 1 or 2 ounces of water. Hold the daguerreotype by the corner with a pair of pliers, rinse it in clear running water, then pour over it the weak cyanide solution (a 3 per cent. solution is usually employed), and return it to the graduate. Repeat this operation several times until the discoloration quite disappears. Wash well in running water, and then, before the surplus water has time to collect in tears upon the image, begin to dry the plate gradually over a spirit lamp, holding the plate in an inclined position so that it will dry from the uppermost corner. The secret of success is in the use of pure water for the final washings and the drying of the image without check or the formation of tears.

Test for Hypo: Potassium permanganate, 2 grains; potassium carbonate, 20 grains; distilled water, 40 ounces. Soak the plate or print to be treated in water for one hour, then remove and add to the water a few drops of the above solution, which will turn a greenish yellow or brown if the water is not free from hypo.

To Flatten Double-weight Prints (George D. Jopson).—A—9 ounces boiling water; ½ ounce gelatine. B—3 ounces boiling water; ½ drachm alum. C—2 drachms oil of cloves. Mix and strain through cheese cloth while hot. To use take a little from the stock and place in a cup. Place cup in hot water until backnig is dissolved. Apply very thin to back of print with soft cloth or a tuft of cotton.

UNITED STATES WEIGHTS AND MEASURES

According to Existing Standards

LINEAR

	Inches	Feet	Yards	Rods	Fur's	Mi.
12 inches = 1 foot.	12 =	1				
3 feet = 1 yard.	36 =	3 =	1			
5.5 yards = 1 rod.	198 =	16.5 =	5.5 =	1		
40 rods = 1 furlong.	7,920 =	660 =	220 =	40 =	1	
8 furlongs = 1 mile.	63,360 =	5,280 =	1,760 =	320 =	8 =	1

SURFACE—LAND

	Feet	Yards	Rods	Roods	Acres
144 sq. ins. = 1 sq. ft.					
9 sq. ft. = 1 sq. yd.	9 =	1			
30.25 sq. yds. = 1 sq. rod.	272.25 =	30.25 =	1		
40 sq. rods = 1 sq. rood.	10,890 =	1,210 =	40 =	1	
4 sq. roods = 1 acre.	43,560 =	4,840 =	160 =	4 =	1
640 acres = 1 sq. mile.	27,878,400 =	3,097,600 =	102,400 =	2,560 =	640

VOLUME—LIQUID

	Gills	Pints	Gallon	Cub. In.
4 gills = 1 pint.	32 =	8 =	1 =	231
2 pints = 1 quart.				
4 quarts = 1 gallon.				

FLUID

Gallon	Pints	Ounces	Drachms	Minims	Cubic Centimetres
1 =	8 =	128 =	1,024 =	61,440 =	3,785,435
	1 =	16 =	128 =	7,680 =	473,179
		1 =	8 =	480 =	29,574
			1 =	60 =	3,697

16 ounces, or a pint, is sometimes called a fluid pound.

TROY WEIGHT

Pound	Ounces	Pennyweights	Grains	Grams
1 =	12 =	240 =	5,760 =	373.24
	1 =	20 =	480 =	31.10
		1 =	24 =	1.56

APOTHECARIES' WEIGHT

lb. Pound	℥ Ounces	ʒ Drachms	℈ Scruples	gr. Grains	Grams
1 =	12 =	96 =	288 =	5,760 =	373.24
	1 =	8 =	24 =	480 =	31.10
		1 =	3 =	60 =	3.89
			1 =	20 =	1.30
				1 =	.C6

The pound, ounce, and grain, are the same as in Troy weight.

AVOIRDUPOIS WEIGHT

Pound	Ounces	Drachms	Grains (Troy)	Grams
1 =	16 =	256 =	7,000 =	453.60
	1 =	16 =	437.5 =	28.35
		1 =	27.34 =	1.77

ENGLISH WEIGHTS AND MEASURES

APOTHECARIES' WEIGHT

20 Grains	=	1 Scruple	=	20 Grains.
3 Scruples	=	1 Drachm	=	60 Grains.
8 Drachms	=	1 Ounce	=	480 Grains.
12 Ounces	=	1 Pound	=	5,760 Grains.

FLUID MEASURE

60 Minims	=	1 Fluid Drachm
8 Drachms	=	1 Fluid Ounce
20 Ounces	=	1 Pint
8 Pints	=	1 Gallon

The above weights are usually adopted in formulas.

All Chemicals are usually sold by

AVOIRDUPOIS WEIGHT

$27^{11}/_{32}$	Grains	=	1 Drachm	=	$27^{11}/_{32}$	Grains
16	Drachms	=	1 Ounce	=	437½	Grains
16	Ounces	=	1 Pound	=	7,000	Grains

Precious Metals are usually sold by

TROY WEIGHT

24 Grains	=	1 Pennyweight	=	24 Grains
20 Pennyweights	=	1 Ounce	=	480 Grains
12 Ounces	=	1 Pound	=	5,760 Grains

NOTE.—An ounce of metallic silver contains 480 grains, but an ounce of nitrate of silver contains only 437½ grains.

UNITED STATES FLUID MEASURE

Gal.	Pints.	Ounces.	Drachms.	Mins.	Cub. In.	Grains.	Cub. C.M.
1	= 8	= 128	= 1,024	= 61,440	= 231.	= 58,328.886	= 3,785.44
	1	= 16	= 128	= 7,680	= 28.875	= 7,291.1107	= 473.18
		1	= 8	= 480	= 1.8047	= 455.6944	= 29.57
			1	= 60	= 0.2256	= 56.9618	= 3.70

IMPERIAL BRITISH FLUID MEASURE

Gal.	Pints.	Ounces.	Drachms.	Mins.	Cub. In.	Grains.	Cub. C.M.
1	= 8	= 160	= 1,280	= 76,800	= 277.27384	= 70,000	= 4,543.732
	1	= 20	= 160	= 9,600	= 34.65923	= 8,750	= 567.966
		1	= 8	= 480	= 1.73296	= 437.5	= 28.398
			1	= 60	= 0.21662	= 54.69	= 3.550

METRIC SYSTEM OF WEIGHTS AND MEASURES

MEASURES OF LENGTH

Denominations and Values		Equivalents in Use	
Myriameter	10,000 meters.	6.2137	miles.
Kilometer	1,000 meters.	.62137	mile, or 3,280 ft. 10 ins
Hectometer	100 meters.	328.	feet and 1 inch.
Dekameter	10 meters.	393.7	inches.
Meter	1 meter.	39.37	inches.
Decimeter	1-10th of a meter.	3.937	inches.
Centimeter	1-100th of a meter.	.3937	inch.
Millimeter	1-1000th of a meter.	0394	inch.

MEASURES OF SURFACE

Denominations and Values		Equivalents in Use
Hectare	10,000 square meters.	2.471 acres.
Are	100 square meters.	119.6 square yards.
Centare	1 square meter.	1,550. square inches

MEASURES OF VOLUME

Denominations and Values			Equivalents in Use	
Names	No. of Liters	Cubic Measures	Dry Measure	Wine Measure
Kiloliter or stere	1,000	1 cubic meter.	1.308 cubic yards.	264.17 gallons.
Hectoliter	100	1-10th cubic meter.	2 bu. and 3.35 pecks.	26.417 gallons.
Dekaliter	10	10 cubic decimeters.	9.08 quarts.	2.6417 gallons.
Liter	1	1 cubic decimeter.	.908 quart.	1.0567 quarts.
Deciliter	1–10	1-10th cubic decimeter.	6.1023 cubic inches.	.845 gill.
Centiliter	1–100	10 cubic centimeters	.6102 cubic inch.	.338 fluid oz.
Milliliter	1–1000	1 cubic centimeter.	.061 cubic inch.	.27 fl. drm.

WEIGHTS

Denominations and Values			Equivalents in Use
Names	Number of Grams	Weight of Volume of Water at its Maximum Density	Avoirdupois Weight
Millier or Tonneau	1,000,000	1 cubic meter.	2204.6 pounds.
Quintal	100,000	1 hectoliter.	220.46 pounds.
Myriagram	10,000	10 liters.	22.046 pounds.
Kilogram or Kilo	1,000	1 liter.	2.2046 pounds.
Hectogram	100	1 deciliter.	3.5274 ounces.
Dekagram	10	10 cubic centimeters.	.3527 ounce.
Gram	1	1 cubic centimeter.	15.432 grains.
Decigram	1–10	1-10th of a cubic centimeter.	1.5432 grain.
Centigram	1–100	10 cubic millimeters.	.1543 grain.
Milligram	1–1000	1 cubic millimeter.	.0154 grain.

For measuring surfaces, the square dekameter is used under the term of ARE; the hectare, or 100 ares, is equal to about 2½ acres. *The unit of capacity* is the cubic decimeter or LITER, and the series of measures is formed in the same way as in the case of the table of lengths. The cubic meter is the unit of measure for solid bodies, and is termed STERE. *The unit of weight* is the GRAM, which is the weight of one cubic centimeter of pure water weighed in a vacuum at the temperature of 4 deg. Cent. or 39.2 deg. Fahr., which is about its temperature of maximum density. In practice, the term cubic centimeter, abbreviated c.c., is generally used instead of milliliter, and cubic meter instead of kiloliter.

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH MEASURE

1 cubic centimeter	= 17 minims						
2 cubic centimeters	= 34 "						
3 "	= 51 "						
4 "	= 68 "	or	1 dram	8 minims			
5 "	= 85 "	"	1 "	25 "			
6 "	= 101 "	"	1 "	41 "			
7 "	= 118 "	"	1 "	58 "			
8 "	= 135 "	"	2 drams	15 "			
9 "	= 152 "	"	2 "	32 "			
10 "	= 169 "	"	2 "	49 "			
20 "	= 338 "	"	5 "	38 "			
30 "	= 507 "	"	1 ounce	0 dram	27 minims		
40 "	= 676 "	"	1 "	3 drams	16 "		
50 "	= 845 "	"	1 "	6 "	5 "		
60 "	= 1014 "	"	2 ounces	0 "	54 "		
70 "	= 1183 "	"	2 "	3 "	43 "		
80 "	= 1352 "	"	2 "	6 "	32 "		
90 "	= 1521 "	"	3 "	1 "	21 "		
100 "	= 1690 "	"	3 "	4 "	10 "		
1000 "	= 1 liter =		35 "	1 "	40 "		

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH WEIGHT

The following table, which contains no error greater than one-tenth of a grain, will suffice for most practical purposes.

1 gram	= 15⅖ grains.			
2 grams	= 30⅘ "			
3 "	= 46⅕ "			
4 "	= 61⅘ "	..................or	1 dram	1⅘ grain
5 "	= 77⅕ "	..................."	1 "	17⅕ grains
6 "	= 92⅗ "	..................."	1 "	32⅗ "
7 "	= 108 "	..................."	1 "	48 "
8 "	= 123⅖ "	..................."	2 drams	3⅖ "
9 "	= 138⅘ "	..................."	2 "	18⅘ "
10 "	= 154⅖ "	..................."	2 "	34⅖ "
11 "	= 169⅘ "	..................."	2 "	49⅘ "
12 "	= 185⅕ "	..................."	3 "	5⅕ "
13 "	= 200⅗ "	..................."	3 "	20⅗ "
14 "	= 216 "	..................."	3 "	36 "
15 "	= 231⅖ "	..................."	3 "	51⅖ "
16 "	= 247 "	..................."	4 "	7 "
17 "	= 262⅖ "	..................."	4 "	22⅖ "
18 "	= 277⅘ "	..................."	4 "	37⅘ "
19 "	= 293⅕ "	..................."	4 "	53⅕ "
20 "	= 308⅗ "	..................."	5 "	8⅗ "
30 "	= 463 "	..................."	7 "	43 "
40 "	= 617⅕ "	..................."	10 "	17⅕ "
50 "	= 771⅗ "	..................."	12 "	51⅗ "
60 "	= 926 "	..................."	15 "	26 "
70 "	= 1080⅕ "	..................."	18 "	0⅕ "
80 "	= 1234⅗ "	..................."	20 "	34⅗ "
90 "	= 1389 "	..................."	23 "	9 "
100 "	= 1543⅕ "	..................."	25 "	43⅕ "
1000 "	= 1 kilogram = 32 oz., 1 dr., 12⅖ gr.			

THE ELEMENTS:

THEIR NAMES, SYMBOLS, AND ATOMIC WEIGHTS OXYGEN STANDARD.

Compiled by HENRY F. RAESS.

1915

Element	Symbol	Weight	Element	Symbol	Weight	Element	Symbol	Weight
Aluminum	Al	27.10	Holmium	Ho	163.50	Rhodium	Rh	102.90
Antimony	Sb	120.20	Hydrogen	H	1.008	Rubidium	Rb	85.45
Argon	A	39.88	Indium	In	114.80	Ruthenium	Ru	101.70
Arsenic	As	74.96	Iodine	I	126.92	Samarium	Sa	150.40
Barium	Ba	137.37	Iridium	Ir	193.10	Scandium	Sc	44.10
Bismuth	Bi	208.00	Iron	Fe	55.84	Selenium	Se	79.20
Boron	B	11.00	Krypton	Kr	82.92	Silicon	Si	28.30
Bromine	Br	79.92	Lanthanum	La	139.00	Silver	Ag	107.88
Cadmium	Cd	112.40	Lead	Pb	207.10	Sodium	Na	23.00
Caesium	Cs	132.81	Lithium	Li	6.94	Strontium	Sr	87.63
Calcium	Ca	40.07	Lutecium	Lu	174.00	Sulphur	S	32.07
Carbon	C	12.00	Magnesium	Mg	24.32	Tantalum	Ta	181.50
Cerium	Ce	140.25	Manganese	Mn	54.93	Tellurium	Te	127.50
Chlorine	Cl	35.46	Mercury	Hg	200.60	Terbium	Tb	159.20
Chromium	Cr	52.00	Molybdenum	Mo	96.00	Thallium	Tl	204.00
Cobalt	Co	58.97	Neodymium	Nd	144.30	Thorium	Th	232.40
Columbium	Cb	93.50	Neon	Ne	20.20	Thulium	Tm	168.50
Copper	Cu	63.57	Nickel	Ni	58.68	Tin	Sn	119.00
Dysprosium	Dy	162.50	Niton	Nt	222.40	Titanium	Ti	48.10
Erbium	Er	167.70	Nitrogen	N	14.01	Tungsten	W	184.00
Europium	Eu	152.00	Osmium	Os	190.90	Uranium	U	238.50
Fluorine	F	19.00	Oxygen	O	16.00	Vanadium	V	51.00
Gadolinium	Gd	157.30	Palladium	Pd	106.70	Xenon	Xe	130.20
Gallium	Ga	69.90	Phosphorus	P	31.04	Ytterbium	Yb	173.50
Germanium	Ge	72.50	Platinum	Pt	195.20	Yttrium	Yt	89.00
Glucinum	Gl	9.10	Potassium	K	39.10	Zinc	Zn	65.37
Gold	Au	197.20	Praseodymium	Pr	140.60	Zirconium	Zr	90.60
Helium	He	3.96	Radium	Ra	226.40			

TABLE OF COMPARATIVE PLATE SPEED NUMBERS

H & D	Watkins P No.	Wynne F No.	H & D	Watkins P No.	Wynne F No.
10	15	24	220	323	114
20	30	35	240	352	120
40	60	49	260	382	124
80	120	69	280	412	129
100	147	77	300	441	134
120	176	84	320	470	138
140	206	91	340	500	142
160	235	98	380	558	150
200	294	109	400	588	154

The above Watkins and Wynne numbers are equivalent to the H and D, only when the latter is determined in accordance with the directions of Hurter and Driffield, that is with pyro-soda developer and using the straight portion only of the density curve.

To convert H and D into Watkins: Multiply H and D by 50 and divide by 34. For all practical purposes the Watkins P number is 1½ times H and D.

To convert Watkins into Wynne F Nos.: Extract the square root and multiply by 6.4.

The above methods have been approved by the Watkins Meter Company and the Infallible Exposure Meter Company.

TABLE OF SOLUBILITIES OF THE MORE COMMON CHEMICALS USED IN PHOTOGRAPHY

Sol.—Soluble. V.S.—Very Soluble. S.S.—Slightly Soluble.
Dec.—Decomposed. Insol.—Insoluble.

	One Part is Soluble in—Parts of Water Cold	Hot
Acetone, Sulphite	1	..
Acid, Citric	0.75	0.50
Acid, Gallic	100	0.3
Acid, Oxalic	9	0.3
Acid, Pyrogallic	2	V.S.
Acid, Tannic	0.6	..
Acid, Tartaric	0.75	.5
Alum	8	.25
Alum, Chrome	6	Dec.
Aluminum, Chloride	0.25	V.S.
Amidol	4	V.S.
Ammonium, Bichromate	5	.25
Ammonium, Bromide	1.3	0.7
Ammonium, Carbonate	4	Dec.
Ammonium, Citrate	0.5	V.S.
Ammonium, Iodide	0.75	V.S.
Ammonium, Nitrate	1	V.S.
Ammonium, Persulphate	1.5	Dec.
Ammonium, Sulphocyanide	0.6	V.S.
Borax	12.5	2
Cadmium, Bromide	1	V.S.
Cadmium, Chloride	0.7	V.S.
Cadmium, Iodide	1	.75
Caustic Potash—Pot. Hydrate	0.5	.25
Caustic Soda—Soda Hydrate	1.5	.5
Copper, Chloride	1	.75
Copper, Sulphate	3	1
Edinol	1	5
Gold, Chloride	V.S.	V.S.
Hydroquinone	17	..
Ferric, Chloride	0.75	.5
Ferric, Amm. Citrate	4	..
Ferric, Potassium Oxalate	15	0.85
Ferric, Sodium Oxalate	1.69	0.55
Ferrous, Sulphate	1.5	.05
Ferrous, Oxalate	Insol.	..
Lead, Acetate	2	1
Lead, Nitrate	2	.7
Mercury, Bichloride	18	2
Metol	Sol.	
Ortol	Sol.	

	One Part is Soluble in—Parts of Water Cold	Hot
Potassium, Bicarbonate	3.5	Dec.
Potassium, Bichromate	10	1
Potassium, Bromide	1.5	1
Potassium, Carbonate	.9	0.50
Potassium, Chloroplatinite	6	V.S.
Potassium, Cyanide	1	0.5
Potassium, Ferricyanide	2.5	1.3
Potassium, Ferrocyanide	3	1.5
Potassium, Iodide	0.75	0.5
Potassium, Metabisulphite	Sol.	Dec.
Potassium, Oxalate	3	2
Potassium, Permanganate	16	10
Potassium, Persulphate	50	Dec.
Potassium, Sulphocyanide	1	0.5
Pyrocatechin	1.25	V.S.
Rochelle Salt	1.5	V.S.
Silver, Nitrate	.75	.25
Sodium, Acetate	3	.5
Sodium, Bicarbonate	12	Dec.
Sodium, Bisulphite	V.S.	..
Sodium, Bromide	1.25	1
Sodium, Carbonate (dry)	6	2.2
Sodium, Carbonate (crys't)	1.5	V.S.
Sodium, Chloride	3	2.5
Sodium, Citrate	1	.5
Sodium, Hyposulphite	1.5	1
Sodium, Iodide	.5	.3
Sodium, Phosphate	6.7	1
Sodium, Sulphide	V.S.	V.S.
Sodium, Sulphite (dry)	4	2
Sodium, Sulphite (crys't)	2.2	1
Sodium, Tungstate	8–12	S.
Uranium, Chloride	V.S.	V.S.
Uranium, Nitrate	.5	.25
Uranium, Sulphate	.5	.25

MISS W. Irving Berkey.

TABLE FOR CALCULATING DISTANCES IN ENLARGING OR REDUCING

From The British Journal Photographic Almanac

Focus of Lens	Times of Enlargement and Reduction							
Inches	1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches	7 Inches	8 Inches
2	4 4	6 3	8 2⅔	10 2½	12 2⅖	14 2⅓	16 2²⁄₇	18 2¼
2½	5 5	7½ 3¾	10 3⅓	12½ 3⅛	15 3	17½ 2⁹⁄₁₀	20 2⁶⁄₇	22½ 2¹³⁄₁₆
3	6 6	9 4½	12 4	15 3¾	18 3⅗	21 3½	24 3³⁄₇	27 3⅜
3½	7 7	10½ 5¼	14 4⅔	17½ 4¾	21 4⅕	24½ 4¹⁄₁₂	28 4	31½ 3⁹⁄₁₀
4	8 8	12 6	16 5⅓	20 5	24 4⅘	28 4⅔	32 4⁴⁄₇	36 4½
4½	9 9	13½ 6¾	18 6	22½ 5⅗	27 5⅖	31½ 5¼	36 5¹⁄₇	40½ 5¹⁄₁₆
5	10 10	15 7½	20 6⅔	25 6¼	30 6	35 5⅚	40 5⁵⁄₇	45 5⅝
5½	11 11	16½ 8¼	22 7⅓	27½ 6⅘	33 6½	38½ 6⁵⁄₁₂	44 6²⁄₇	49½ 6³⁄₁₆
6	12 12	18 9	24 8	30 7½	36 7⅕	42 7	48 6⁶⁄₇	54 6¾
7	14 14	21 10½	28 9⅓	35 8¾	42 8⅖	49 8⅙	56 8	63 7⅞
8	16 16	24 12	32 10⅔	40 10	48 9⅗	56 9⅓	64 9¹⁄₇	72 9
9	18 18	27 13½	36 12	45 11¼	54 10⅘	63 10½	72 10²⁄₇	81 10⅛

The object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical center. The use of the table will be seen from the following illustration: A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of 6 inches equivalent focus. He must therefore look for 4 on the upper horizontal line and for 6 on the first vertical column and carry his eye to where these two join, which will be 30-7½. The greater of these is the distance the sensitive plate must be from the center of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times, the same method must be followed; but in this case the greater number will represent the distance between the lens and the picture to be copied, the latter that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be 12 inches, as this number is not in the column of focal lengths, look out for 6 in this column and multiply by 2, and so on with any other numbers.

TABLES OF DISTANCES AT AND BEYOND WHICH ALL OBJECTS ARE IN FOCUS WHEN SHARP FOCUS IS SECURED ON INFINITY

Focal Length of Lens in Inches	Ratio marked on Stops													
	f/4	f/5.6	f/6	f/7	f/8	f/10	f/11	f/15	f/16	f/20	f/22	f/32	f/44	f/64
	Number of feet after which all is in focus													
4	33	24	22	19	17	13	12	9	8	7	6	4	3	2
4¼	38	27	25	21	19	15	14	10	10	7	7	5	3½	2½
4½	42	30	28	24	21	17	15	11	11	8½	7½	5½	4	3
4¾	47	34	31	27	24	19	17	12	12	9½	8½	6	5	3
5	52	36	35	30	26	21	19	14	13	10½	9½	6½	5½	3½
5¼	57	40	38	33	28	23	21	15	14	11½	10½	7	5½	3½
5½	63	45	43	36	31	25	23	17	15	12½	11½	7½	6	4
5¾	68	50	46	38	34	27	25	18	17	13½	13	8½	6½	4
6	75	54	50	42	38	30	28	20	19	15	14	9	7	4½
6¼	81	58	54	46	40	32	29	22	20	16	15	10	7½	5
6½	87	62	58	50	44	35	32	23	22	17½	16	11	8	5½
6¾	94	67	63	54	47	38	34	25	24	19	17	12	8½	6
7	101	72	68	58	51	40	37	27	25	20	18	12½	9	6
7¼	109	78	73	62	54	44	39	29	27	22	20	13½	10	6½
7½	117	83	78	64	58	47	42	31	29	24	21	14½	10½	7
7¾	124	90	83	71	62	50	45	33	31	25	22	15½	11	7½
8	132	96	88	76	68	52	48	36	32	28	24	16	12	8
8¼	141	100	94	80	71	56	51	37	35	29	25	17½	12½	8½
8½	150	104	100	84	76	60	56	40	38	30	27	19	13½	9
8¾	156	111	104	89	78	63	57	42	39	32	29	20	14	10
9	168	120	112	96	84	67	61	45	42	34	31	21	15	10½
9¼	180	127	116	101	90	71	65	47	45	35	32	22	16	11
9½	190	133	125	107	95	75	68	50	47	37	34	24	17	12
9¾	197	141	131	113	99	79	72	52	50	39	36	25	18	12½
10	208	148	140	120	104	83	75	55	52	42	38	26	19	13

If sharp focus is secured on any of the distances shown, then with the stop indicated all objects are in focus from half the distance focused on up to infinity.

LENGTH OF STUDIO

REQUIRED FOR LENSES OF DIFFERENT FOCAL LENGTHS FROM 6 TO 8 FEET IS ALLOWED FOR THE CAMERA AND OPERATOR

From "Photographic Lenses" by BECK and ANDREWS

Focus of Lens	Size	Kind of Portrait	Length of Studio	Dist. of Lens from Object
Inches			In Feet	In Feet
6	Carte de Visite 3¼x4¼	Full Length	18 to 20	11 to 12
7½	Carte de Visite	Full Length	22 to 25	14 to 15
8½	Carte de Visite	Full Length	24 to 28	17 to 19
		Bust	10 to 15	5
9½	Cabinet and smaller groups	Full Length	20 to 23	12 to 13
		Bust	12 to 17	7
11	Cabinet and 5x7 groups	Full Length	25 to 30	17 to 18
		Bust	13 to 20	8
14½	Cabinets, panels and 6½x8½ groups	Full Length	32 to 40	23 to 24
		Bust	14 to 20	7
19	10x12 portraits or groups	Full Length	20 to 25	13
		Bust	14 to 20	7
24	16x20 portraits or groups	Full Length	25 to 30	14
		Bust	14 to 20	8

"UNIFORM SYSTEM" NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$

In the following table Mr. S. A. Warburton calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the "uniform system" of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	f	U. S. No.	f	U. S. No.
1	1/16	15	14.06	58	210.25
1¼	.097	16	16	59	217.56
1.414	⅛	17	18.06	60	225.00
1½	.140	18	20.25	61	232.56
1¾	.191	19	22.56	62	240.25
2	¼	20	25.00	63	248.06
2¼	.316	21	27.56	64	256
2½	.390	22	30.25	65	264.06
2.828	½	22.62	32	66	272.25
2¾	.472	23	33.06	67	280.56
3	.562	24	36.00	68	289.00
3¼	.660	25	39.06	69	297.56
3½	.765	26	42.25	70	306.25
3¾	.878	27	45.56	71	315.06
4	1	28	49.00	72	324.00
4¼	1.12	29	52.56	73	333.06
4½	1.26	30	56.25	74	342.25
4¾	1.41	31	60.06	75	351.56
5	1.56	32	64	76	361.00
5¼	1.72	33	68.06	77	370.56
5½	1.89	34	72.25	78	380.25
5.656	2	35	76.56	79	390.06
5¾	2.06	36	81.00	80	400.00
6	2.25	37	85.56	81	410.06
6¼	2.44	38	90.25	82	420.25
6½	2.64	39	95.06	83	430.56
6¾	2.84	40	100.00	84	440.00
7	3.06	41	105.06	85	451.56
7¼	3.28	42	110.25	86	462.25
7½	3.51	43	115.56	87	473.06
7¾	3.75	44	121.00	88	484.00
8	4	45	126.56	89	495.06
8¼	4.25	45.25	128	90	506.25
8½	4.51	46	132.25	90.50	512
8¾	4.78	47	138.06	91	517.56
9	5.06	48	144.00	92	529.00
9¼	5.34	49	150.06	93	540.56
9½	5.64	50	156.25	94	552.25
9¾	5.94	51	162.56	95	564.06
10	6.25	52	169.00	96	576.00
11	7.56	53	175.56	97	588.06
11.31	8	54	182.25	98	600.25
12	9.00	55	189.06	99	612.56
13	10.56	56	196.00	100	625
14	12.25	57	203.06		

American Photographic Societies

This list is compiled from information received from an inquiry form sent to the soceties during the latter half of 1920. It includes many societies not given in the 1920 Annual, but falls short of completeness as a record of the photographic societies of America. Secretaries of societies not here listed are urged to send us particulars of their organization so that the list may be fully representative of society activities.—Editor.

AMERICAN INSTITUTE PHOTOGRAPHIC SECTION—New York City. Headquarters, 322-324 West 23d Street. Established March 26, 1859. Stated meetings, first and third Mondays of each month. No meetings during Summer months. *Chairman*, Oscar G. Mason; *Vice-Chairman*, Robert A. B. Dayton; *Treasurer*, James Y. Watkins; *Secretary*, John W. Bartlett, M.D., F.R.P.S., 149 West 94th Street.

ASSOCIATED CAMERA CLUBS OF AMERICA—Headquarters, 878-880 Broad Street, Newark, N. J. *President*, Julius F. Graether, Newark Camera Club; *Secretary*, Louis F. Bucher, Newark Camera Club; *Treasurer*, Henry C. Brewster, Newark Camera Club: *Western Viee-President*, Todd Hazen, Oregon Camera Club; *Southern Viee-President*, George H. Rowe, Photographic Club of Baltimore; *Central Viee-Presidert*, Dr. Maclay Lyon, Kansas City Camera Club; *Eastern Vice-President*, J. L. Hanna, Columbia Photographic Society, Philadelphia. Motive—Closer affiliation of Camera Clubs, Annual Exhibits, Interchanges of Prints and Slides, as well as ideas, and literature. Membership September 1, twenty-four clubs. Association organized May 1, 1919.

BROOKLYN INSTITUTE OF ARTS AND SCIENCES, PHOTOGRAPHIC SECTION—Headquarters, Academy of Music Building, Lafayette Ave., Brooklyn, N. Y. Organized 1886. Meetings for general discussion every Monday evening except during summer months. Membership 73. Courses in Photography given. Demonstrations in the various processes every third Friday. Annual Exhibit in May. *President*, William E. Macnaughton; *Vice-President*, William A. Alcock; *Treasurer*, J. Paterson; *Seeretary*, Sophie L. Lauffer, 591a Decatur Street, Brooklyn, N. Y.

BOSTON CAMERA CLUB—Boston, Mass. Established 1881. Incorporated 1886. Membership, 75. *President*, P. Hubbard; *Seeretary*, John H. Thurston, 50 Bromfield Street.

BOSTON YOUNG MEN'S CHRISTIAN UNION CAMERA CLUB—Boston, Mass. Headquarters, 48 Boylston Street, Boston. Organized, 1908. *President*, Merton L. Vincent; *Vice-President*, Louis Astrella, 26 Quincy Street, Roxbury; *Treasurer*, C. E. Dodge; *Seeretary*, Ernest Gustavsen, 234 Hyde Park Ave., Forest Hills. Meetings first Tuesday each month at club rooms, 48 Boylston Street. Member Associated Camera Clubs of America.

BUFFALO CAMERA CLUB—Buffalo, N. Y. Headquarters, Kinne Building, corner Main and Utica Streets. Annual election of officers, fourth Thursday in April; regular meeting nights, second and fourth Tuesdays of each month. *President*, F. W. Cowell; *Vice President*, N. G. Sherk; *Seeretary*, Charles L. Peck, 1101 Elmwood Avenue. Member Associated Camera Clubs of America.

CALIFORNIA CAMERA CLUB—San Francisco, Cal. Headquarters, 833 Market Street, San Francisco. Established March 18, 1890. Incorporated April 5, 1890. Membership 431. Date of meeting, second Tuesday, monthly. Monthly print exhibitions. *President*, Dr. Edward G. Eisen, *Secretary*, Wm. C. Mackintosh. Members of other camera clubs are cordially invited to visit our rooms when in San Francisco.

CAMERA CLUB—New York. Headquarters, 121 West 68th Street. Established by consolidation of Society of Amateur Photographers and New York Camera Club in April, 1896. Incorporated May 7, 1896. Membership 200. Date of annual meeting, first Thursday after the first Monday in January. *Seeretary*, Monroe W. Tingley.

CAMERA CLUB OF HARTFORD—Hartford, Conn. Membership, 12. *President*, Dr. Frederic S. Crossfield, 75 Pratt Street; *Vice-President*, Clayton P. Chamberlain; *Corresponding Seeretary*, Eugene D. Field; *Treasurer*, A. L. Chase; *Secretary*, Charles R. Nason, 224 Oxford Street.

"CAMERADS"—New Brunswick, N. J. Headquarters, corner Church and George Streets. Established April 24, 1890. *Seeretary*, Harvey Iredell; D.D.S., Lock Box 34, New Brunswick.

CAMERA PICTORIALISTS OF LOS ANGELES—Los Angeles, Cal. Headquarters, Room 31, Walker Auditorium. Association formed for strictly pictorial work; the holding of an annual International Salon; and for the good of the cause generally. Membership limited to twenty. Meetings, first Monday of month. *Directar,* Louis Fleckenstein; *Secretary,* Ernest Williams.

CAPITAL CAMERA CLUB, INC.—Washington, D. C., 638 Eye Street, N.W. Founded May 1, 1891. Annual meeting, first Thursday in January. *President,* Frederick L. Pittman; *Vice-President,* G. W. Anderson; *Secretary,* H. W. Mills; *Treasurer,* J. H. Weimer; *Librarian,* Miss Lucy Powell. Date of annual exhibition, March.

CENTRAL Y. M. C. A. CAMERA CLUB—Headquarters, 1421 Arch Street, Philadelphia, Pa. Club organized 22 years ago. Meetings, third Monday in month. *President,* Bernard B. Wolff; *Vice-Presidents,* Geo. D. Gassner, J. F. Jackson; *Secretary,* S. K. Taylor; *Financial Secretary,* W. S. Snyder. Membership, 93.

CHICAGO CAMERA CLUB—Chicago, Ill. Headquarters, 31 W. Lake Street. Established February 14, 1904. Incorporated February 19, 1904. Date of meetings, every Wednesday. *President,* J. J. Ryan; *Vice-President,* J. E. Mead; *Secretary,* P. T. Tarnoski; *Treasurer* F. E. Rich. Member of Associated Camera Clubs of America.

CHICAGO PHOTO FELLOWS—Chicago, Ill. Organized September 8, 1909. Memhership, 8. *Carrespandent,* F. M. Tuckerman, 1109 Railway Exchange, Chicago.

CITY HALL CAMERA CLUB—Los Angeles, Cal. Headquarters, Room 502, Hosfield Building. Organized May 25, 1914. Membership, 24. *Correspondert,* W. C. Sawyer.

CLEVELAND PHOTOGRAPHIC SOCIETY—Cleveland, Ohio, 1110 Huron Road, N.E. Established June 7, 1913. Permanent organization effected at meeting of June 18. Meetings every Wednesday. *President,* Geo. Cook; *Secretary-Treasurer,* L. H. Schofield. Member Associated Camera Clubs of America.

COLUMBIA PHOTOGRAPHIC SOCIETY—Philadelphia, Pa. Headquarters, 2526 North Broad Street, Philadelphia. Established 1889. Incorporated July 3, 1894. Membership, 80. Business meeting first Monday of each month; other Mondays, lectures or demonstrations. Member of Associated Camera Clubs of America. *President,* Daniel Fritz; *Vice-President,* Theo. D. Mitchell; *Treasurer,* C. F. Davis, 701 Eldridge Avenue, West Collinswood, N. J.; *Secretary,* Harry R. Till, 6103 N. Warnock Street, Philadelphia, Pa.

DARTMOUTH CAMERA CLUB—Headquarters, 7-8 Robinson Hall, Hanover, N. H. Organized, 1915. Membership, 30. *President,* A. R. Steiner. All communications addressed to Prof. Leland Griggs, Hanover, N. H. Member Associated Camera Clubs of America.

ELMIRA CAMERA CLUB—Elmira, N. Y. Headquarters, 116 Baldwin Street, Elmira. Established, 1902. Membership, 30. Meets first Wednesday each month. *President,* C. G. Leonardi; *Secretary-Treasurer,* E. Radeker Stancliff, 240 Lake Street. Member Associated Camera Clubs of America.

ELYSIAN CAMERA CLUB—Hoboken, N. J. Headquarters, 307 Washington Street. Established, 1902. Date of meeting, first Friday each month. Membership, 40. *President,* Charles Westerburg; *Vice-President,* Richard Thiessen; *Treasurer,* Julius Nelson; *Financial Secretary,* Wm. Lindeman; *Secretary,* George Sting; *House Cammittee,* Conrad Lambert, Chairman; *Print Committee,* Albert Harrass, Chairman; *Admissian Committee,* Adolph Kloeblen, Chairman; *Librarian,* Father Graf. Member of Associated Camera Clubs of America.

ESSEX CAMERA CLUB—Newark, N. J. Headquarters, 872 Broad Street, Newark, N. J. Organized July, 1899. Membership, 40. Date of meetings, fourth Tuesday of every month. *President,* George A. Hardy; *Secretary,* L. F. Gebhardt, South 11th Street.

GILD OF PHOTOGRAPHERS OF THE SOCIETY OF ARTS AND CRAFTS OF BOSTON, MASS.—*Dean,* Mr. Joseph P. Loud; *Secretary* and *Treasurer,* Mr. Parker H. Kemble, Massachusetts General Hospital, Boston; *Cauncillors,* Miss Florence Maynard, Miss Helen M. Murdoch, Miss Lois L. Howe. Organized February 18, 1916. Meetings held at members' studios.

GRAND RAPIDS CAMERA CLUB—Member Associated Camera Clubs of America. Headquarters, 2 Central Place, where demonstrations and inspiration meetings are held each Thursday evening from September to June inclusive, with occasional Field days during the Summer months. *President,* Dr. A. Williams; *Vice-President,* Prof. H. C Doane; *Secand Vice-President,* Miss Vera Bennett; *Treasurer;* A. Steenhagen; *Secretary,* Miss Loa G. Winegar.

INTERNATIONAL PHOTOGRAPHIC ASSOCIATION—San Francisco, Cal. Founded 1908. *President,* F. B. Hinman, Evergreen, Col.; *General Secretary,* Fayette J. Clute, 413-415 Claus Spreckels Building, San Francisco; *Stereascopic Album Director,* James B. Warner, 413-415 Claus Spreckels Building, San Francisco, Cal.; *Director Post Card Division,* John Bieseman, Hemlock, Ohio; *Director Lantern-Slide Eastern Division,* Arthur H. Farrow, 51 Richelieu Terrace, Newark, N. J.; *Director Lantern Slide Western Division,* A. E. Davies, 1327 Grove Street, Berkeley, Cal. The *State Secretaries*: Alabama—Richard Hines, Jr., Barton Academy Building, Mobile. California—W. E. Thomson, 3211 School Street, Fruitvale, Cal. Colorado—O. E. Aultman, Plested Building, Trinidad. Florida—Capt. E. S. Coutant, Box 73, Stuart. Georgia—L. O. Surles, P. O. Box 434, Cuthbert. Idaho—Eugene Clifford, 902 9th Avenue, Lewiston. Illinois—George A. Price, Box 286, Champaign. Indiana—H. E. Bishop, 551 East 40th Street, Indianapolis. Iowa—C. W. Parker, Mapleton. Maryland—E. G. Hopper, 218 East 20th Street, Baltimore. Massachusetts—John Mardon, 10 High Street, Boston. Michigan—W. E. Ziegenfuss, M.D., 171 Richton Street, Detroit. Minnesota—Leonard A. Williams, 622 2d Avenue, South, St. Cloud. Mississippi—George W. Askew, Jr., 211 34th Avenue, Meridian. Missouri—Wharton Schooler, R. F. D. No. 2, Eolia. New Hampshire—Mrs. A. Leonora Kellogg, Box 224, Londonberry. New York—Charles F. Rice, P. O. Box 517, Mamaroneck. New Jersey—Arthur H. Farrow, 51 Richelieu Terrace, Newark. North Dakota—Jas. A. Van Kleeck, 619 Second Avenue, North Fargo. Pennsylvania—L. A. Sneary, 2822 Espy Avenue, Pittsburgh. South Dakota—C. B. Bolles, L. B., 351, Aberdeen. Texas—J. B. Oheim, P. O. Drawer M, Henrietta. Utah—John C. Swenson, A.B., Provo. West Virginia—William E. Monroe, Box 298, Point Pleasant.

KANSAS CITY CAMERA CLUB, 1919-1920—Suite 501, Bryant Building, Kansas City, Mo. Organized 1914. Club meets second Monday of each month. Annual exhibition in November. *President,* Richard M. Seibel; *Vice-President,* R. L. Welker; *Secretary-Treasurer,* Dr. Maclay Lyon. Member Associated Camera Clubs of America.

LITTLE ROCK CAMERA CLUB—Little Rock, Ark. Organized in Spring, 1916. Limited membership. Advanced amateurs. Meets every two weeks. *President,* Dr. R. A. Tate, 5th and Main Streets; *Secretary,* Roderick Gallie, 411 West 13th Street.

MISSOURI CAMERA CLUB—St. Louis, Mo. Club Rooms, 706 Merchants-Laclede Building, 408 Olive Street. Organized November, 1903. Meetings, second and fourth Tuesday. *President,* E. H. Wayman; *Vice-President,* Harvey W. Beggs; *Treasurer,* C. T. Sullivan; *Secretary,* F. K. Adams, 412 N. 6th Street, St. Louis.

MONTREAL AMATEUR ATHLETIC ASSOCIATION CAMERA CLUB—Montreal, Canada. Headquarters, M. A. A. A. Building, 250 Peel Street. Organized May 1, 1906. *President,* F. H. Ruel; *Vice-President,* Dr. C. C. Birchard; *Secretary,* W. S. Weir; *Treasurer,* R. E. Melville.

NEWARK CAMERA CLUB, INC.—878-880 Broad Street, Newark, N. J. Organized 1888. Incorporated 1910. Meetings, second and fourth Mondays in each month. Motto, "SOMETHING OF INTEREST EVERY MONDAY NIGHT." *President,* Arthur M. Platt; *Vice-President,* Edwin F. Galloway; *Secretary,* Louis F. Bucher; *Treasurer,* Henry C. Brewster. Membership now 200 active. Member and organizer of Associated Camera Clubs of America. Visitors Welcome.

NEW BRITAIN CAMERA CLUB—Organized 1892. *President.* W. B. Rossberg; *Vice-President,* H. P. Richards; *Secretary* and *Treasurer,* Paul A. Stahl, 260 Corbin Avenue, New Britain, Conn. Meets second and fourth Tuesdays, 173 Main Street. Member Associated Camera Clubs of America.

NEW HAVEN CAMERA CLUB—739 Chapel Street. Organized 1911. Membership, 35. *President,* John R. Shelden; *Vice-President,* Thomas Bowers; *Secretary* and *Treasurer,* J. George Blunden. Meetings held every Thursday. Business meetings, first Thursday in the month. Member Associated Camera Clubs of America.

OAK PARK CAMERA CLUB—Oak Park, Ill. Organized February, 1915. Membership, 25. *Director,* H. P. T. Matte; *President,* G. F. Chase; *Vice-President,* F. D. Manchester; *Secretary,* F. M. Ingals; *Treasurer,* Mrs A. R. Hanson. Address communications to H. P. T. Matte, Lake Street and Lombard Avenue. Member Associated Camera Clubs of America.

ORANGE, CAMERA CLUB—East Orange, N. J. Headquarters, Main and Clinton Streets. Established March 21st, 1892. Incorporated May 19th, 1893. Membership, 115. Date of meetings, first and third Saturdays of each month, except July, August and September. *President,* Robert M. Crater; *Secretary,* C. Russell Powelson, Main and Clinton Streets, East Orange, N. J. Member Associated Camera Clubs of America.

OREGON CAMERA CLUB—Portland, Oregon. Headuarters, Fifth Floor Elks' Building. Established 1895. Incorporated 1903. Membership, 100. Date of annual meeting, second Tuesday in January. *President,* Todd Hazen; *Secretary,* Otto Michal. Date of annual exhibit, early in Spring. Member Associated Camera Clubs of America.

OVERSEAS CAMERA CLUB—Detroit, Mich. Headquarters, 543 Cass Avenue. Member Associated Camera Clubs of America.

PHOTOGRAPHIC CLUB OF BALTIMORE CITY—Baltimore, Md. Headquarters, Maryland Academy of Sciences Building, 105 West Franklin Street. Established 1885. Incorporated 1890. Membership, active, 50. Meetings, first Tuesday in month. *President,* Lloyd D. Norris, Patterson Park, Baltimore; *Secretary,* N. Wright Crowder, 45 Hopkins Place, Baltimore. Member Associated Camera Clubs of America.

PHOTO FELLOWS CLUB—Vancouver, Canada. Headquarters, 650 Granville Street. Re-organized 1920. *Secretary-Treasurer,* C. J. Duncan.

PHOTOGRAPHIC SOCIETY OF PHILADELPHIA—Philadelphia, Pa. Headquarters, 1615-1617 Sansom Street. Established November, 1862. Incorporated April 24, 1885. Membership, 95. Date of meetings: Members, second Wednesday. *President,* Robert P. Achuff; *Secretary,* M. R. Witt, 1615 Sansom Street; *Treasurer,* Harold F. A. Starr. Date of members' annual exhibition, March. Member Associated Camera Clubs of America.

PICTORIAL PHOTOGRAPHERS OF AMERICA—New York City. Headquarters, National Arts Club, 119 East 19th Street. Meetings first Monday evening in each month from October to June. *President,* Clarence H. White; *Vice-President,* Dr. A. D. Chaffee; *Hon. Vice-Presidents,* Gertrude Kasebier, Prof. Chas. F. Chandler; *Treasurer,* Dr. Chas. H. Jaeger; *Recording Secretary,* Jerry D. Drew; *Corresponding Secretary,* Margaret Watkins. Member Associated Camera Clubs of America.

PITTSBURGH ACADEMY OF SCIENCE AND ART (PHOTOGRAPHIC SECTION)—Pittsburgh, Pa. Headquarters, Carnegie Institute, Schenley Park. Organized January 23, 1900. Membership, 100. Meetings, second and fourth Tuesday in each month at Carnegie Institute. *President,* O. C. Reiter, 2424 Penn Avenue; *Vice-President,* M. C. Rypinski; *Secretary-Treasurer,* Chas. K. Archer, 1412 Carnegie Bldg., Pittsburgh, Pa.; *Lantern-Slide Director,* P. F. Squier, 483 Campbell Street, Wilkinsburg, Pa.; *Print Director,* S. A. Martin, 923 Chislett Street, Annual salon, Carnegie Art Gallery, March. Address all communications to Chas. K. Archer, Secretary, 1412 Carnegie Bldg., Pittsburgh, Pa.

PITTSBURGH CAMERA CLUB—Pittsburgh, Pa. Established December, 1910. Membership, 15. *President,* Robert L. Sleeth, Jr.; *Treasurer,* William McK. Ewart, 2524 Center Avenue; *Secretary,* Charles W. Doutt, Crafton, Pa.

PITTSBURGH SALON OF PHOTOGRAPHIC ART—Pittsburgh, Pa. Under auspices of Photographic Section of the Academy of Science and Art. Membership consists of the leading pictorialists in the United States. *President,* O. C. Reiter, 2424 Penn Avenue, Pittsburgh, Pa.; *Secretary,* Charles K. Archer, 1412 Carnegie Bldg., Pittsburgh, Pa. Salon held Carnegie Institute, March. Last day of entry, February 10.

PORTLAND CAMERA CLUB PHOTOGRAPHIC SECTION OF THE PORTLAND SOCIETY OF ART—Portland, Me. Headquarters, L. D. M. Sweat Memorial, Spring, corner High Street. Established 1899. Membership, 86. Date of meetings, every Monday evening. *President,* E. Roy Monroe; *Vice-President,* Roger P. Jordan; *Secretary-Treasurer,* William T. Starr. Date of annual exhibition, in March. Member Associated Camera Clubs of America.

POSTAL PHOTOGRAPHIC CLUB—Headquarters, Washington, D. C. Established December, 1888. Membership, 40. Date of meetings, no regular meeting. *President,* Charles E. Fairman; *Secretary,* Ernest L. Crandall, 1331 Newton Street, N. E., Brookland, Washington, D. C. Albums circulate among members monthly, except August and September.

READING CAMERA CLUB—Reading, Pa. Headquarters, 752 North Street. *Secretary,* J. Trate Gerhard. Member Associated Camera Clubs of America.

ST. LAWRENCE CAMERA CLUB—Ogdensburg, N. Y. Headquarters, 74 Caroline Street. Established 1900. Membership, 10. Date of meetings, at the call of the Secretary. *President,* Arthur L. Jameson; *Secretary,* John N. Brown, 74 Caroline Street.

ST. LOUIS CAMERA CLUB—St. Louis, Mo. Organized February 12, 1914. Devoted to the interest and advancement of the art of photography. Meetings every second and fourth Thursdays at 8 p. m., Central Public Library, Olive Street, between 13th and 14th Streets. *President,* Oscar C. Kuehn; *Vice-President,* E. W. Lidaker; *Secretary,* S. F. Duckworth, 2838 Shenandoah Avenue, Shenandoah. Member Associated Camera Clubs of America.

SOUTHERN CALIFORNIA CAMERA CLUB—522 Wilcox Building, Los Angeles. Membership, 40. *President,* Ralph S. Hawkins; *Vice-President,* Miss Edna Welch; *Secretary,* Miss Francis M. Purdy; *Treasurer,* E. H. Tabor. *Board of Governors,* in addition to the officers, J. C. Carlton, W. L. Jennings, John C. Stick. Member Associated Camera Clubs of America. Send notices public exhibitions, contests and salons.

TOLEDO CAMERA CLUB—Toledo, Ohio. Member of the American Federation. Headquarters, Museum of Art. Meet second Wednesday of each month. *President,* John F. Jones; *Vice-President,* R. E. Ferguson; *Secretary,* Harry A. Webb, 1017 Prouty Avenue; *Treasurer,* M. W. Chapin.

TRINIDAD CAMERA CLUB—Trinidad, Colo. Established April 21, 1906. Meetings, second Wednesday of every month at O. E. Aultman's Studio. Monthly competitions. *President,* W. L. Crouch; *Vice-President,* Wilber Davis; *Secretary* and *Treasurer,* W. Dearden, 717 Colorado Avenue. Member Associated Camera Clubs of America.

WASHINGTON Y. M. C. A. CAMERA CLUB—Washington, D. C. Headquarters, Central Y. M. C. A. Building. Membership, 32. *President,* Myron F. Myers; *Secretary,* Miss Elizabeth N. Brownley, 908 Que St., N. W.

WATERBURY CAMERA CLUB—Waterbury, Conn. Headquarters, 48 Edson Avenue. Member Associated Camera Clubs of America

WESLEY CAMERA CLUB—Headquarters, Bell Theatre Building. Organized April 6, 1912. Meeting the first Monday of each month. *President,* W. A. Drewelow; *Vice-President,* Halvor Flom; *Secretary* and *Treasurer,* Lawrence Burke (Wesley, Iowa).

YONKERS CAMERA CLUB—Yonkers, N. Y. Headquarters, Hollywood Inn Building. *President,* W. R. Cronk; *Vice-President,* Wm. Beck; *Secretary,* Elijah F. Munn; *Librarian,* C. B. Carling; *Trustees,* F. W. Wocher, Wm. S. Mitchell, Geo. Stengel.

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